MAY 14, 1951

# American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Hot-extruding a steel propeller blade — see page 2

## Tapping — A SPECIAL REPORT

## Mechanized Production Control

# winter has lost its sting

## . . . thanks to the speed and precision of Heald Bore-Matics

Gone is the old wood burning parlor stove. Gone, too, are the laborious hand methods of manufacture that produced it.

Today's compact, automatic heating plants are built in quantity and at low cost — because essential parts are precision finished on Heald machines. That means *faster, better* and *easier* production, with higher precision, greater accuracy and fewer rejects. For all Heald Bore-Matics and grinding machines are designed and built with the extra care and precision that assure maximum production efficiency for you.

Remember — when it comes to precision finishing, it pays to come to Heald.

**Fuel Unit Housings**
***FINISHED FASTER***
**on a new Heald Model 222 Bore-Matic**

### in this case HERE'S WHY

1. High rapid traverse rate — extra table speed decreases time spent between actual borizing operations.

2. High precision heads — Heald Red Heads and cross feed units meet the strictest accuracy requirements.

3. Double end setup — permits operations on both ends of the work in a single automatic cycle.

**THE HEALD MACHINE COMPANY**
**WORCESTER 6, MASSACHUSETTS**

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Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

# American Machinist

MAGAZINE OF METALWORKING PRODUCTION



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*American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index*


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**AMERICAN MACHINIST**, published bi-weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder.

EXECUTIVE, EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 18, N.Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President, Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice President, Director of Advertising; J. E. Blackburn, Jr., Vice President, Director of Circulation.

SUBSCRIPTIONS: Address correspondence to American Machinist-Subscription Service, 330 West 42nd Street, New York 18, N. Y. Allow ten days for change of address. Please indicate position and company connection on all subscription orders.

Single copies, 50c. Subscription Rates—United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $25 for one year, $50 for two years, $40 for three years. Entered as second-class matter, August 13, 1945, at Post Office, New York, N.Y., under the act of March 3, 1879. Printed in U.S.A.



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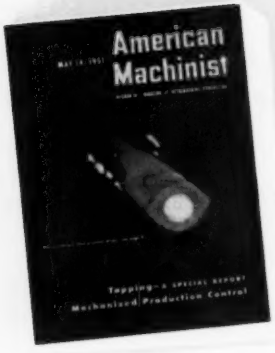


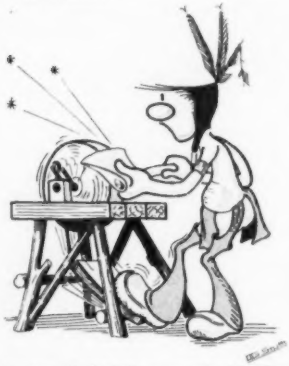

# Chips and QUIPS

***Hot Extrusion*** . . . Our cover is the first full-color reproduction of hot-extruding a propeller blade. The Kodachrome was taken at the Adrian, Mich., Air Force Pilot Plant by Curtiss-Wright engineers, using the light from the metal alone. It shows "Method A", in which the fins that later become leading and trailing edges of the blade extend the full length of the extrusion. In "Method B", described first in *AM* for Mar. 5 (p128B-E), 3-step extrusion produces a finless shank. Note the color of the extrusion—already darker in the thinner section at rear, even though that is the most recently extruded. The carrier over the extrusion has since been found unnecessary.

***Tapping*** . . . Our second Special Report on Threading (first, on Thread Chasing, in Mar. 5 *AM*) deals with Tapping. Again it is a broad-gage job, condensing the mass of information available on the subject into a compact 16-page handbook. Included are selection and use of solid and adjustable taps, tapping attachments, fixtures, speeds, feeds, lubricants, and trouble shooting. We trust you will find it as useful as reprint orders and reader surveys indicate its predecessor was.

***Statitron*** . . . North American Aviation, Inc., developed a miniature Van de Graff electrostatic generator, not for atomic use but for very practical purposes. Its 2-million-volt discharge workhardens aluminum alloys instantaneously, alters physical properties, builds forces to cause failure, hardens non-heat-treatable metals.

***Atomized*** . . . Vapor Heating Corp. must produce stainless-steel spray nozzles to very high precision. The answer is exact drilling and reaming in indexing jigs under adjustable-speed drills. Louis Gross explains how it's done, with pictures by Ben Brosheer, our Western Editor.



"American Machinist", as conceived by Donald Smith, reminds you to see the first of his series of "Grinetics" on page , this issue.

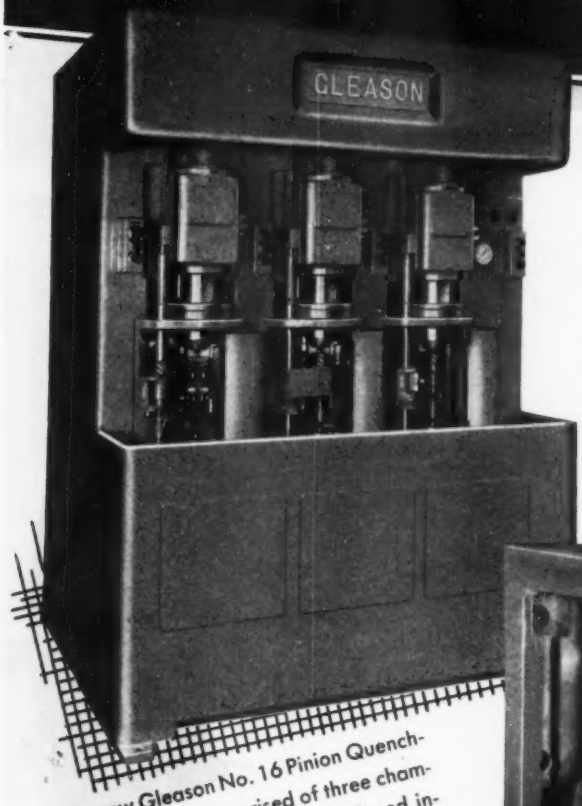
***Tooling*** . . . A group of selected Shop Shots, a page on how a small company welded up a machine base, and some selected diemaker's kinks are included in this issue, as well as several full-length tooling features. We describe another Volkert die and show how Curtiss-Wright polishes jet-turbine blades. All are interesting tooling problems with answers that are widely applicable. . . . Harvey Hallenberg of Essley Machinery also describes how man-machine charts are used in selling new equipment.

***Coming*** . . . *AM* for May 28 will include a short Special Report on Tooling for Finishing Investment Castings. There'll also be what amounts to a second Report: two articles on large boring mills, one describing a conversion into a vertical-bar machine capable of handling pieces 28 ft long. There'll be articles, too, on assembling fine-wire brushes, on production control, solid carbide saws, another Volkert die, on honing, planing elevator rail, and on modernizing plant lighting.

**PRODUCTIONEERS** . . . Native of Woodbridge, N. J., Louis Wozar has lived in Dayton O., since 1942, when he started with United Aircraft Products, Inc., as a production engineer. Six years later he was general works manager. He came to Dayton Pump and Manufacturing Co. in June 1948 and now is vice president and associate general manager. Mr. Wozar is self-made—he has served in practically every shop position from apprentice on up and has acquired his engineering education through evening schools and home study. In this issue, the new mechanized production control system at Dayton Pump is described by Mr. Wozar and . . .

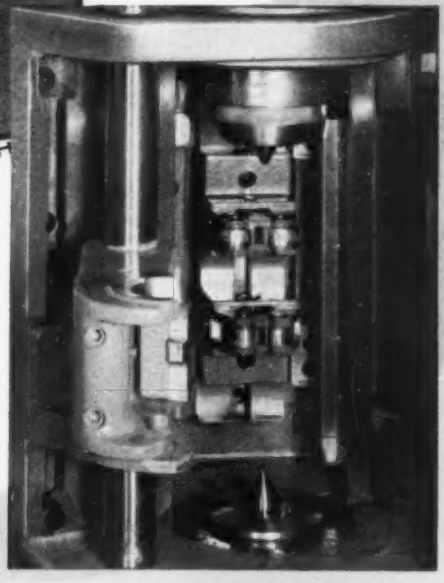
Charles Rike, who is production manager of Dayton Pump. Mr. Rike also came up the hard way. Trade-school courses plus installation of production and material controls at United Aircraft Products, Inc., under the supervision of a firm of industrial consultants, paved the way for his appointment as supervisor of production estimating and time study. He then became supervisor of methods, having responsibility for processing, tools, plant layouts, operation sheets, estimates, and time study. In 1946, production and material control also was put under his supervision. He left United in 1948.

# COMPLETELY AUTOMATIC PINION QUENCHING




## WITHOUT DISTORTION

An entirely new design for pinion quenching . . . with each individual unit operating independent of the others to assure continuous fast production of *straight* hardened pinions . . . simple to operate . . . completely automatic . . . this machine eliminates distortion . . . further straightening of shafts becomes unnecessary.



The new Gleason No. 16 Pinion Quenching Machine is comprised of three chambers. Each pinion may be hardened independent of the others through a completely automatic operation from the time the pinion is placed into the loader jaws until it has been rotated on centers against rollers during quench and returned to unloading position.

BUILDERS OF BEVEL GEAR MACHINERY · GLEASON · FOR OVER EIGHTY-FIVE YEARS ·

*Write for more information on this modern way of pinion quenching.*

**GLEASON WORKS**

1000 UNIVERSITY AVENUE · ROCHESTER 3, NEW YORK

# CONTINUOUS GRINDING WITH

Two CINCINNATI FILMATIC No. 3 Centerless Grinders, in the plant of a prominent aviation equipment manufacturer, equipped to continuously grind piston rods.

CINCINNATI

**CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES**

# TWO-MACHINE TEAM DOUBLES PRODUCTION

**PRODUCTION DATA**

| | |
|---|---|
| *Part name* | Hydraulic piston rod (14" long) |
| *Material* | Alloy steel |
| *Stock removal* | First machine .061" on diameter<br>Second machine .005" on diameter |
| *Surface finish* | 20 micro |
| *Production* | 143 per hour |

One of the most economical ways to achieve large volume production is by the continuous machining method. How this was accomplished for precision grinding operations is illustrated here... two CINCINNATI FILMATIC No. 3 Centerless Grinders are hitched together to pull the production load of grinding piston rods. A CINCINNATI Feedmatic Hopper starts them through the first machine and a conveyor takes them to the second machine for the finish grind. And to maintain the highest quality finish, filters remove sludge from the coolant. Now one man controls this production team, and output per man hour is more than double the former method. ¶Continuous production becomes a reality with CINCINNATI FILMATIC Centerless Grinders handling the job. Their FILMATIC grinding wheel spindle bearings will never quit regardless of the load... lubrication is principally automatic... hydraulic grinding wheel truing... variety of standard attachments, including Feedmatic Hoppers for thrufeed and infeed operations. Other features and advantages are outlined in catalog No. G-570-1, and brief specifications may be found in Sweet's Catalog File.

**CINCINNATI GRINDERS INCORPORATED**
**CINCINNATI 9, OHIO**

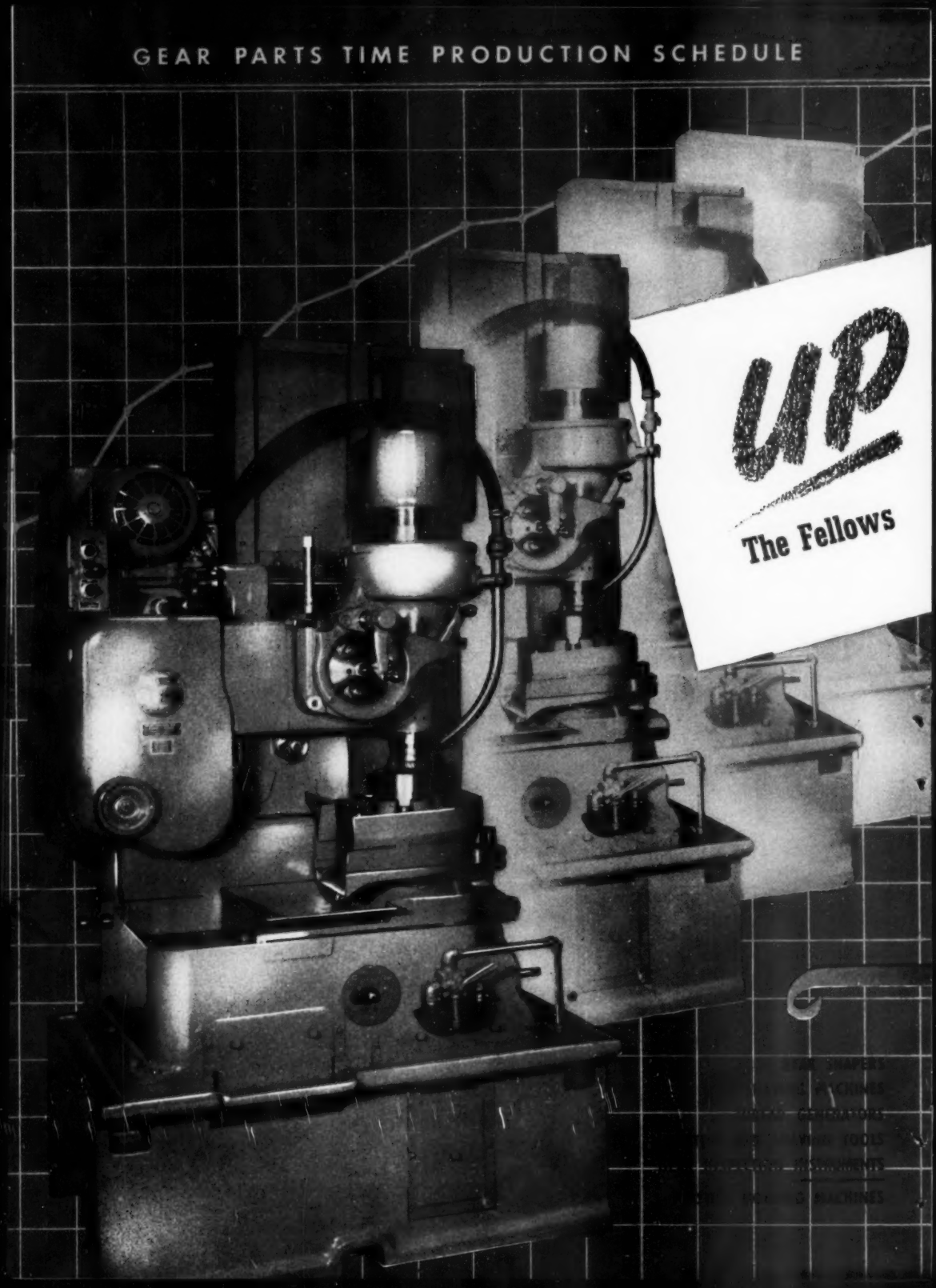
CINCINNATI FILMATIC No. 3 Centerless Grinding Machine. Complete specifications may be obtained by writing for catalog No. G-570-1.

CINCINNATI Type "E" Feedmatic Hopper

# NATI

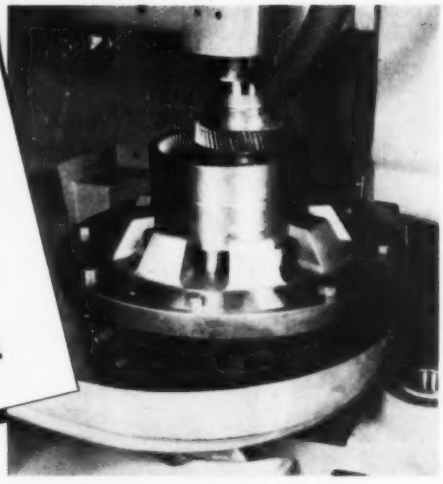
**CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES**

GEAR PARTS TIME PRODUCTION SCHEDULE



# GO TIME SAVING POSSIBILITIES

## 7A-Type Gear Shaper sets a Production Pace for 1951



*For an internal gear part an air-operated diaphragm-type chuck like this makes loading and unloading a simple operation—for stop-watch timing.*

- **AUTOMATIC QUICK-STOPPING OF CUTTER-SPINDLE RECIPROCATION**
- **AUTOMATIC POSITIONING OF CUTTER AT TOP OF STROKE (without coasting)**
- **AIR-OPERATED QUICK CLAMPING CHUCK**

Due to its amazing versatility, the 7A-Type Gear Shaper is able to compete with other production machines on a floor-to-floor time saving basis. High cutting speeds and precision control have always been there. To these advantages have been added speed-up of work handling, quick-acting work holding devices, etc.

The machines illustrated are set up to cut cast iron internal helical gears 27/32" face width, 16 pitch, 20° pressure angle, 79 teeth (5.1313" p.d.)—and to finish each gear in 2 cuts in 5 minutes floor-to-floor time.

If your requirements are not sufficiently large to require the enormous production possibilities of the 10-spindle Rotary Gear Shaper, let us work out time estimates based on 7A-Type Machines with the latest auxiliary modifications. Write, wire or phone the nearest Fellows engineering-sales office.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 2206 Empire State Bldg., New York 1.

The Van Norman No. 38 Miller gives you many cost-cutting advantages not found in any other miller of this type. The heavy, rugged column and sturdy ram are constructed to take all types of cuts including carbide milling. The massive cutterhead has a 10 HP motor driving the spindle, providing a 100% increase in power. Cutterhead speeds have been increased to 2000 RPM for high speed work.

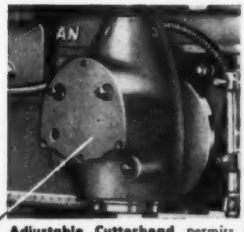
It will pay you to investigate the advantages of this New No. 38. Check its features against other millers and you'll find it gives you greater opportunities to cut costs and increase production. Write for information.

# Production Work Hours . . .

# VAN NORMAN No. 38

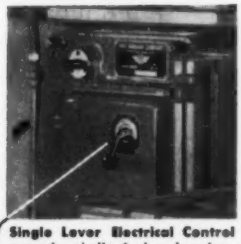
## RAM TYPE MILLING MACHINE

**A Heavy-Duty Miller that provides many cost-cutting advantages**



**Adjustable Cutterhead** permits horizontal, angular and vertical milling on *one* machine. Graduated in degrees for easy positioning.

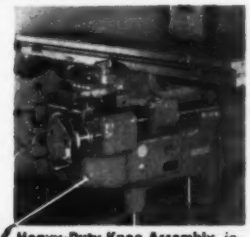
**Front and Rear Controls** of all power feeds can be operated from either position. Manual controls are also at front and rear.



**Single Lever Electrical Control** controls spindle, feed, and coolant. The same lever reverses spindle direction.

**Load Meter** is right before the operator's eyes . . . gives visual indication of the "percent of load" that the machine is being operated under.

**Massive Ram** is heavier and stronger than on other machines. It is reinforced throughout for ruggedness and long life.

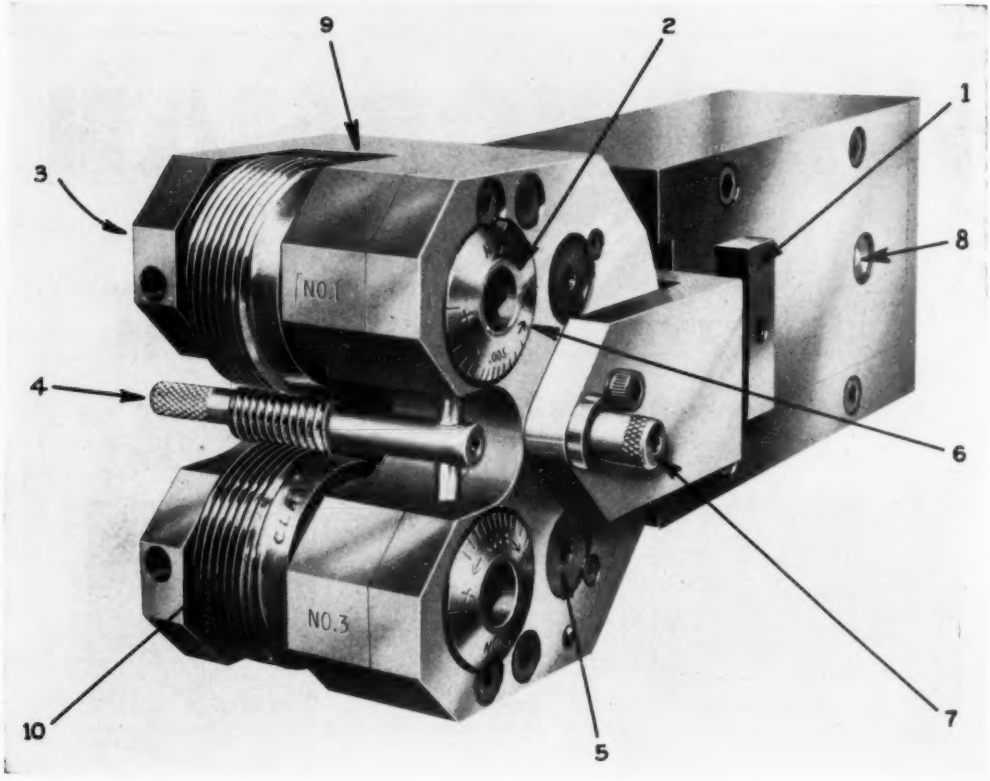


**Heavy-Duty Knee Assembly,** including table and saddle, is designed as an integral unit to provide maximum rigidity and accuracy.

**VAN NORMAN COMPANY**
**SPRINGFIELD 7, MASSACHUSETTS**

# THREADING OPERATIONS

## *NEW* LANROLL *ATTACHMENT THREADS*




1. Gauge block quickly places rolls on center with respect to workpiece.
2. Graduated dials simplify pitch diameter adjustment.
3. Means of adjustment (not shown) provides compensation for slightly tapered workpieces.
4. Timing gauge quickly times one roll with the other.
5. Two compensators reduce to absolute minimum load imposed on gear train.
6. Easily replaceable roller-spindle bearings (not shown).
7. Pivot pin forms fulcrum on which roller box can be tilted to avoid indexing interference.
8. Rocker pin allows freedom of movement which assures proper alignment of attachment with workpiece.
9. Heat-treated alloy steel roller box guarantees maximum rigidity.
10. Easily replaceable long-life rolls.

**The LANDIS *Machine* COMPANY**

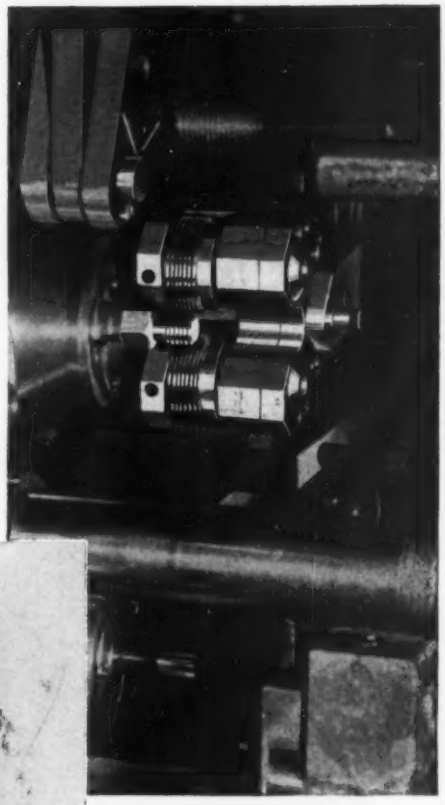
# REDUCED FROM 2 to 1!

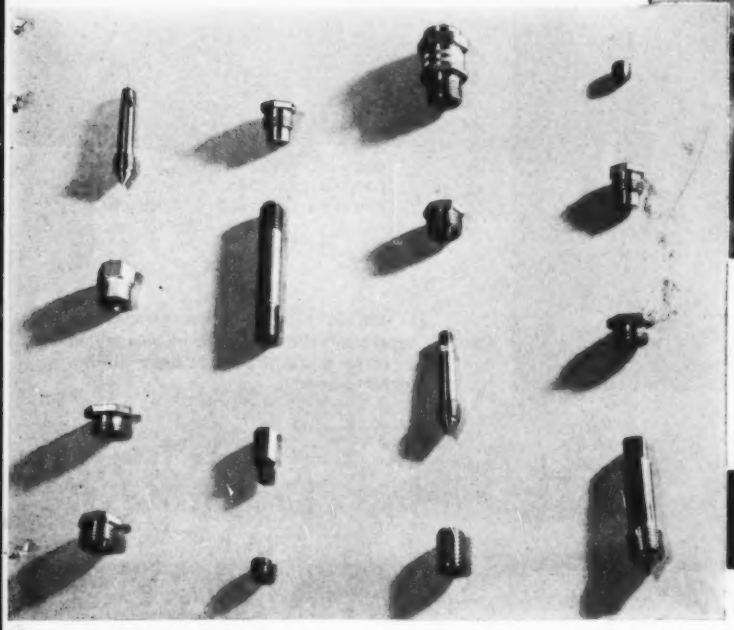
## *WORK INACCESSIBLE TO DIE HEADS*

LANDIS has recently perfected a thread-rolling attachment for automatic screw machines and turret lathes which is designed to roll threads to close tolerances at a high rate of speed. It is particularly adaptable to work which—due to shoulders or other interference resulting from product design—would require a separate and secondary operation if threaded by a die head.

The new LANROLL Attachment fits perfectly into the sequence of established machining operations, and offers a number of important advantages. By enabling the work to be completed at one chucking, it reduces manufacturing costs and steps up production, as well as assuring close concentricity between the rolled thread and other sections of the workpiece.

Precision thread quality is guaranteed by the use of two diametrically-opposed rolls which reduce and equalize the feed load, thus eliminating tapered and out-of-round threads. Write for detailed information on this latest addition to the LANDIS line.





LANDIS
REG. U.S. TRADE MARK PAT. OFF.

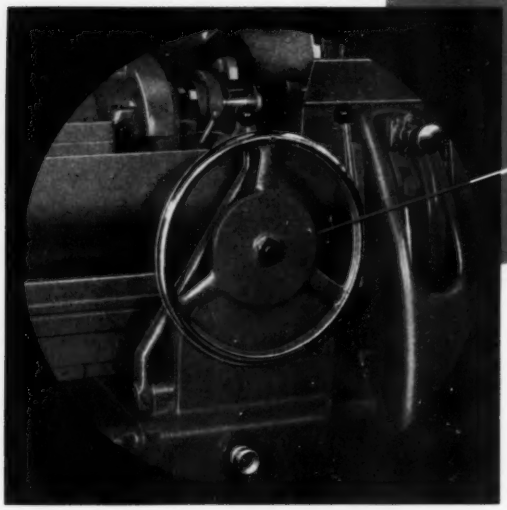
WAYNESBORO
PENNA., U. S. A.

# NEW LANDIS TOOL

## 16"-25" Hydraulic Crank Pin Grinder

### Simplified Operation Increases Production

- **Sensitive Traverse Positioning to Divide Spark when Grinding Sidewalls**
- **Improved Hydraulic and Electrical Controls**
- **Telescoping Covers Protect Ways**
- **Automatic Way Lubrication with Pressure Protection**
- **Automatic Spindle Bearing Lubrication with Pressure Protection**
- **Improved Vee Belt Drive for Work Rotation**



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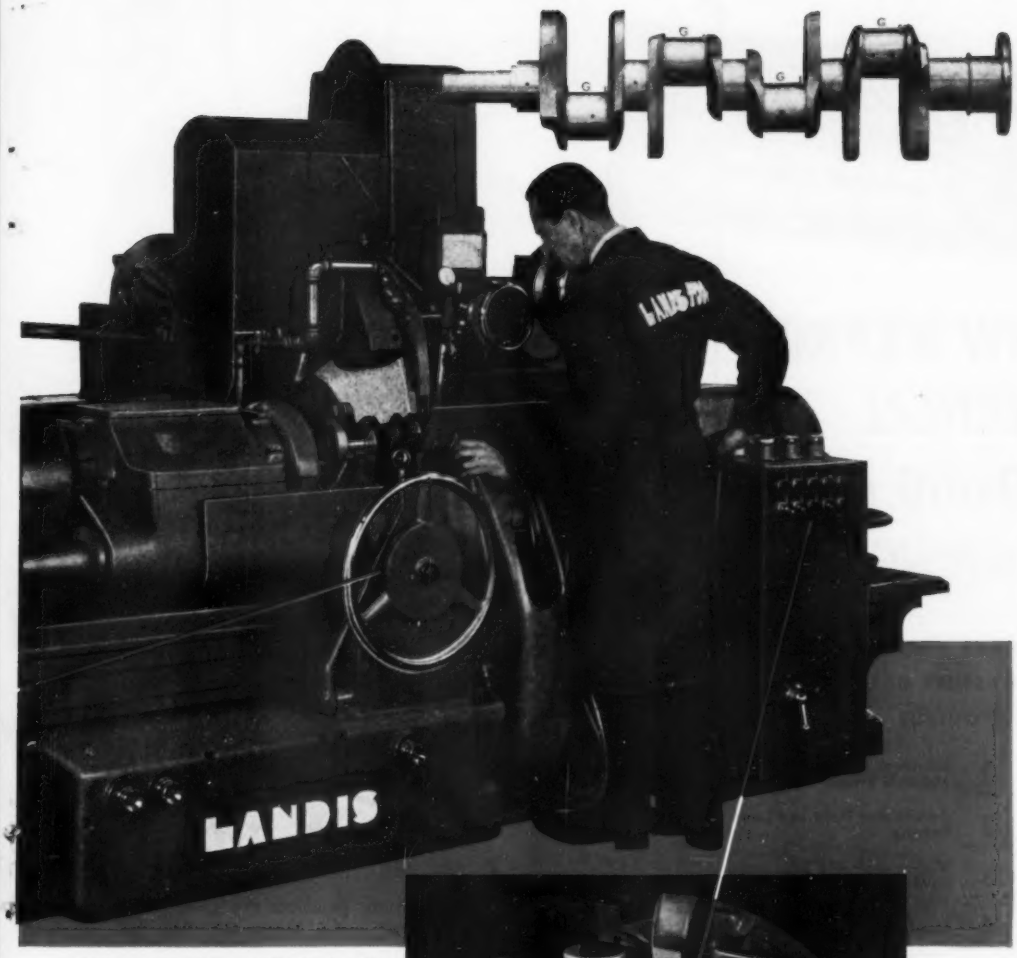
Grouped operating controls for work rest, cycle control, traverse positioning, auxiliary clamping and traverse speed.

**LANDIS TOOL**

*Precision Grinders*



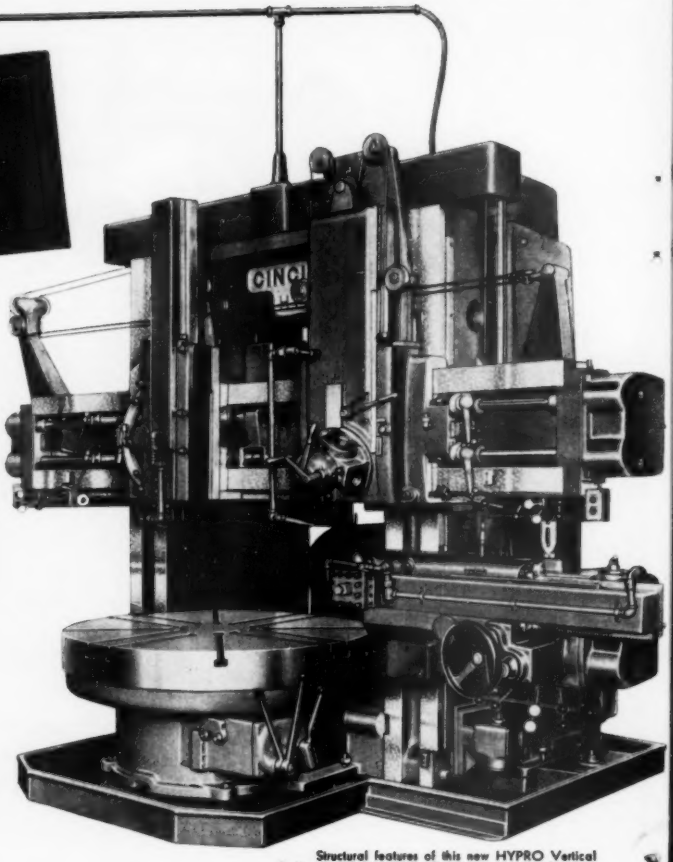

16" x 42" Type DH Hydraulic Crank Pin Grinder with optional hydraulically operated overhead wheel dresser.

Infeed control, electrical push buttons and hydraulic controls all grouped for operator's convenience.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

*These* ADVANCE BUILT-IN DESIGN FEATURES OF

# NEW HYPRO VERTICAL BORING and TURNING MILLS



Structural features of this new HYPRO Vertical Boring and Turning Mill offer the user outstanding advantages in performing a broad range of operations on a wide variety of work pieces.

**IMPROVE MACHINING ACCURACY AND ASSURE GREATER WORK OUTPUT**

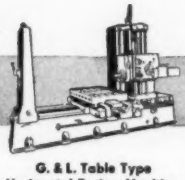
1. Individual Traverse Motors to Rail and Side Heads.
2. Anti-Friction Thrust and Load Bearings.
3. Various Rail and Side Head Combinations.
4. Five Different Drive Arrangements.
5. Convenient Pendant Control.
6. Plus—Clearly Marked Easy-to-Use Feed Controls—Helical Rack and Pinion for Smooth Ram Feed—Anti-Friction Bearing Table Transmission—Safety Interlocks and Limit Switches.

Vertical boring and turning practices are greatly advanced with the new 54", 64", 6', and 6' Heavy HYPRO machines. The many built-in design features of these vertical mills not only offer higher accuracy in precision operations, but also enable the machine operator to produce more finished work in less time.

Many standard and special production boring and turning problems can be handled more efficiently on a HYPRO machine. When you need quick solutions to difficult machining problems, you will find definite assistance offered by experienced HYPRO engineers. An inquiry now may easily end your trouble.

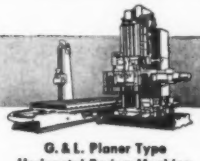
**GIDDINGS & LEWIS**
**FOND DU LAC**

G&L HYPRO



G. & L. Table Type Horizontal Boring Machine

G. & L. Floor Type Horizontal Boring Machine



G. & L. Planer Type Horizontal Boring Machine

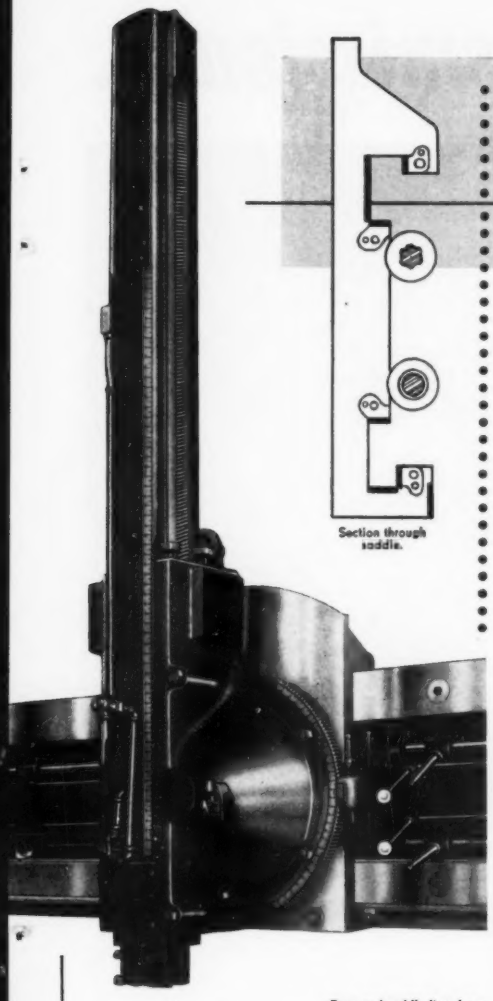
# NEW *Non Metallic* RAM and SADDLE BEARINGS...

## EXTEND MACHINING ACCURACY OVER PERIODS OF LONG, SEVERE USAGE

Engineered adaptation of non-metallic bearings to ram and saddle marks an important departure in HYPRO machine construction. This entirely new and outstanding improvement insures precision operation under hardest service.

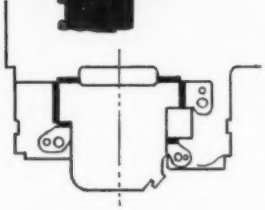
Rigid bearing support of the ram on its guide, and the saddle on the machine cross rail eliminates chatter, excessive cutter breakage, binding and similar shortcomings that tend to hamper normal machining functions. In addition, these bearings are resistant to the abrasive action of metal dust, forging scale and sand from improperly cleaned castings. Non-metallic bearings are unaffected by heat, both transfer and residual. Such heat often distorts solid metal bearings which distortion influences overall machining accuracy.

Non-metallic bearings are installed on all HYPRO Vertical Boring and Turning Mills with great care by skilled G. & L. workmen. This fully supervised work assures both trouble-free machine performance and long life.





Section through saddle.



Ram and saddle line drawings indicate position of non-metallic bearings on new HYPRO Boring and Turning Mill.

Section through ram and swivel.

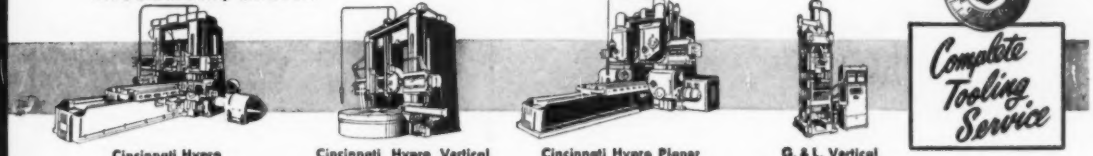
### WHY NON-METALLIC BEARINGS ARE SUPERIOR TO CONVENTIONAL METAL BEARINGS

*They...*

- **resist abrasive action** of dust, chips and foreign material that score precision finished surfaces.
- **are dimensionally stable,** these bearings are not affected by changes in temperature nor will they absorb moisture which causes surface deformation.
- **retain surface oil films** to improve lubrication but will not become saturated through absorption.
- **wear slowly and evenly** because of dense structure.
- **are resilient to shock,** absorbing sudden impact from cutting or other causes.
- **insulate against heat** and will not transfer generated heat to other machine components.
- **reduce friction,** for they have high bearing quality which does not vary through expansion or contraction.

## MACHINE TOOL COMPANY

**WISCONSIN, U. S. A.**



Cincinnati Hypro Double Housing Planer

Cincinnati Hypro Vertical Boring and Turning Mill

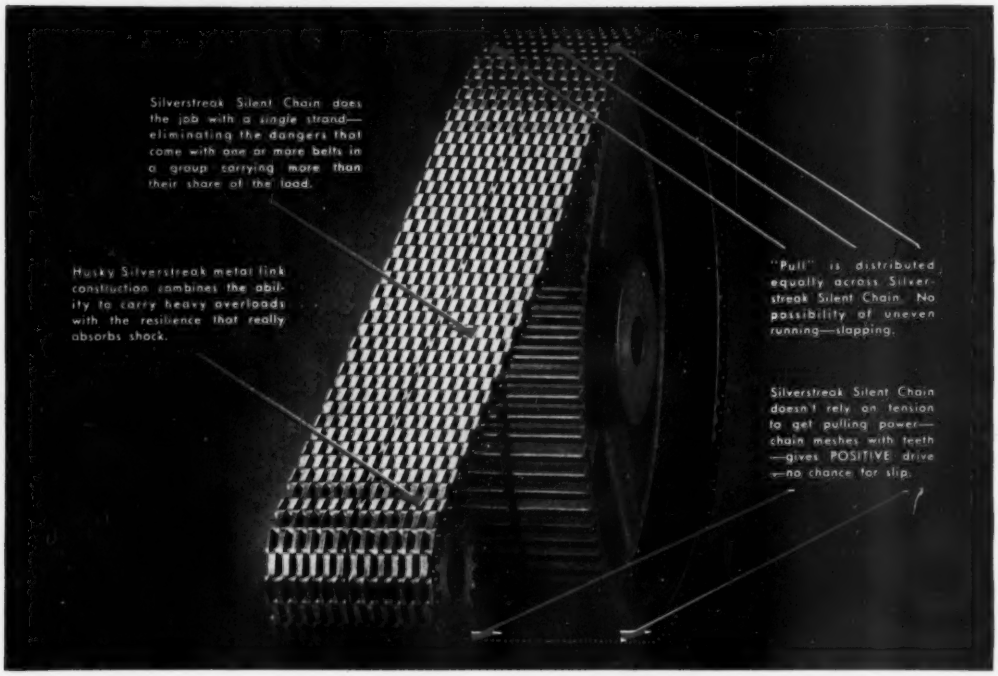
Cincinnati Hypro Planer Type Milling Machine

G. & L. Vertical Plastics Injection Press

DAVIS

*Complete Tooling Service*

# *Get full rpm transmission...*


Silverstreak Silent Chain does the job with a single strand—eliminating the dangers that come with one or more belts in a group carrying more than their share of the load.
Husky Silverstreak metal link construction combines the ability to carry heavy overloads with the resilience that really absorbs shock.
"Pull" is distributed equally across Silverstreak Silent Chain. No possibility of uneven running—slapping.
Silverstreak Silent Chain doesn't rely on tension to get pulling power—chain meshes with teeth—gives POSITIVE drive—no chance for slip.

## LINK-BELT Silverstreak Silent Chain Drives

# Slip-proof
# Slap-proof
# Shock-proof

TAKE the proven road to increased production — through the best in high-speed power transmission. You'll find Link-Belt Silverstreak Silent Chain Drives are 98.2% efficient. With normal maintenance, you have a *positive* drive that runs for years and years.

And note this important point — on extremely short centers Silverstreaks lose none of their efficiency. What's more, reduction ratios as high as 10-to-1 are frequently used. Both of these Silverstreak features save you valuable space.

One test will prove to you why thousands of production-minded engineers have standardized on Link-Belt Silverstreak Silent Chain Drives.

LINK-BELT

12,200

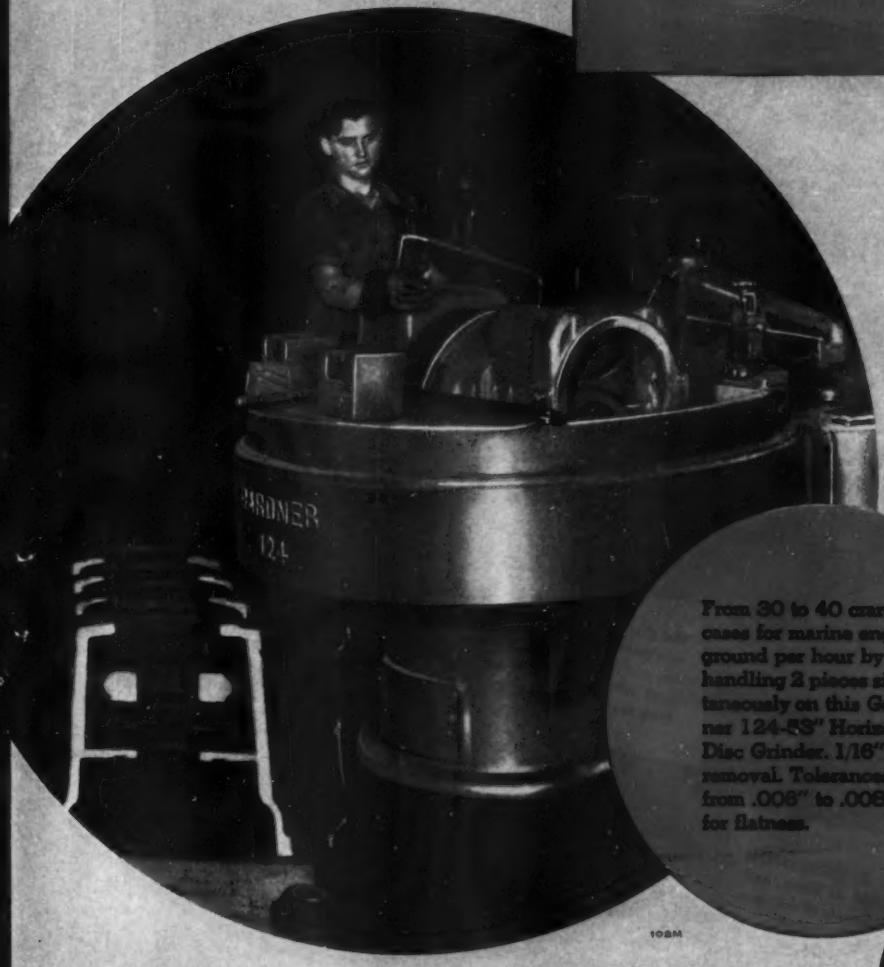
SILVERSTREAK SILENT CHAIN DRIVES

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities.

**How to Cut Flat Surface Grinding Costs of Large, Heavy Castings**

# GARDNER

horizontal disc Grinders



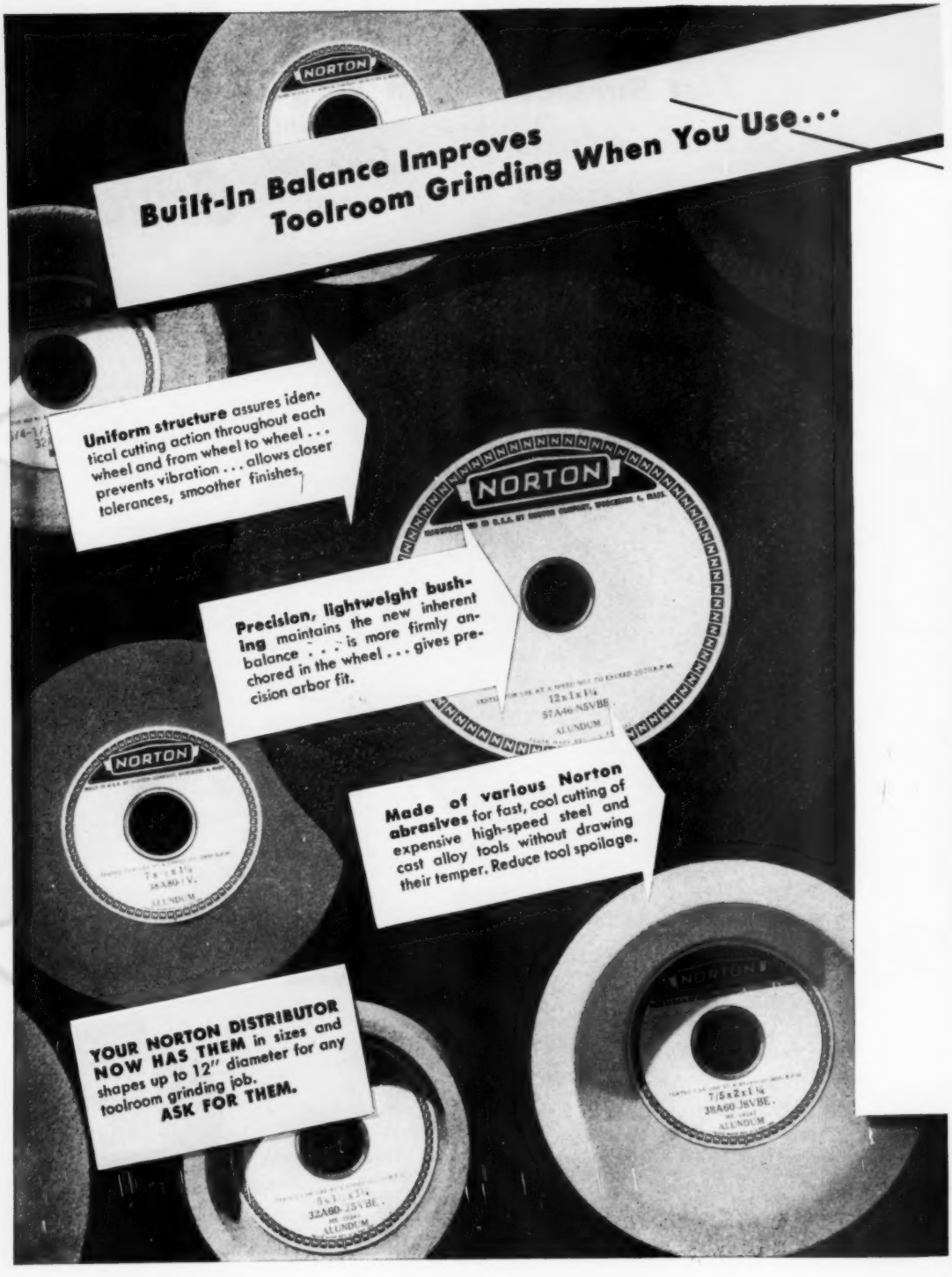

**Free hand operation without fixtures for high production**

From 30 to 40 crank cases for marine engines ground per hour by handling 2 pieces simultaneously on this Gardner 124-53" Horizontal Disc Grinder. 1/16" stock removal. Tolerances, from .006" to .008" for flatness.

***Complete Range of Sizes From 18" to 72" Diameters***

**GARDNER MACHINE COMPANY**

410 Gardner Street • Beloit, Wis.


Built-In Balance Improves Toolroom Grinding When You Use...
Uniform structure assures identical cutting action throughout each wheel and from wheel to wheel . . . prevents vibration . . . allows closer tolerances, smoother finishes.
Precision, lightweight bushing maintains the new inherent balance . . . is more firmly anchored in the wheel . . . gives precision arbor fit.
Made of various Norton abrasives for fast, cool cutting of expensive high-speed steel and cast alloy tools without drawing their temper. Reduce tool spoilage.
YOUR NORTON DISTRIBUTOR NOW HAS THEM in sizes and shapes up to 12" diameter for any toolroom grinding job.
ASK FOR THEM.
NORTON
ALUNDUM

# NORTON *NEW-PROCESS* GRINDING WHEELS

***Truly uniform within each wheel and from wheel to wheel***

## NO OTHER WHEELS GIVE YOU ALL 3

**1. YOU GET CLOSER TOLERANCES** because the built-in balance of Norton *New-Process* Wheels reduces vibration . . . eliminates chatter marks . . . lasts for the life of each wheel.

**2. YOU GET MORE UNIFORM GRINDING ACTION** because the more uniform structure of Norton *New-Process* Wheels causes more even wheel wear. You also have perfect confidence that all identically marked wheels *will perform identically.*

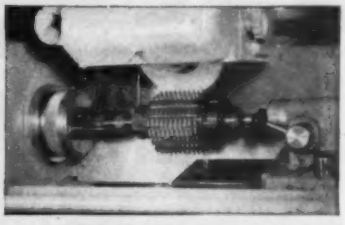
**3. YOU REDUCE TOOL SPOILAGE** because Norton *New-Process* Wheels, made with the *right* selection of fast, smooth-cutting Norton abrasives, allow heavier cuts in expensive, heat-sensitive, high-speed steel and cast alloy tools . . . without drawing their temper.

**COMPARE** Norton *New-Process* grinding wheels with any others in your toolroom . . . and watch production rise and costs drop. Your nearby Norton distributor or representative will help you select from the wide range of Norton tool and cutter wheels ones that will improve your toolroom grinding.

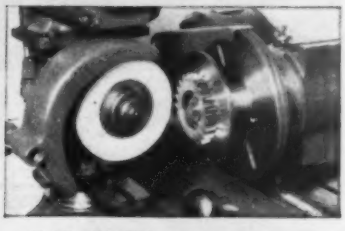
**NORTON COMPANY, WORCESTER 6, MASS.**
Warehouses in 5 cities. Distributors in all principal cities.

**NORTON**
**ABRASIVES**
*Making better products to make other products better*

**ALL TEETH ARE THE SAME HEIGHT** when you sharpen milling cutters with long-wearing free-cutting Norton *New-Process* Wheels . . . they hold size all the way around the cutter.



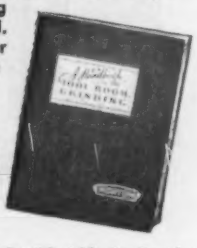
**CORNERS ARE HELD,** yet free cutting action maintained, when you sharpen gear cutting and splining hobs with Norton *New-Process* Alundum* Wheels.



**FLAT, CHATTER-FREE SURFACES** on tools and dies directly result from the built-in, work-hugging balance and dimensional accuracy of Norton *New-Process* Wheels.

**FREE 160-PAGE HANDBOOK FOR TOOLROOM OPERATORS**

Here's the most comprehensive guide to top-production, bottom-cost toolroom grinding ever published. Every operator should have a copy of this Handbook on Toolroom Grinding. Write for your free copy of FORM 835-1B



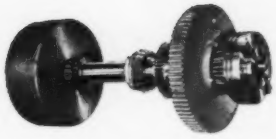
*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

# GREATER RIGIDITY

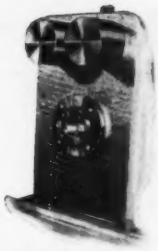
KEARNEY & TRECKER MILWAUKEE **CK's**

FROM overarms to column base, Kearney & Trecker CK milling machines are NEW! Look them over. You'll find these machines give you "more" of every desirable feature you need to make them more productive, more profitable for you. *Talk about rigidity* — these new CK columns are the most rigid milling machine columns we've ever designed! They give you 1000 pounds more of dense, high-test iron, scientifically distributed in closer heavier ribbing, in box section, sponson construction . . . to effectively absorb vibration from the heaviest cutting loads.

**Replacement of obsolete machine tools is an**

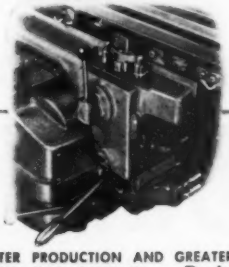


**GREATER CUTTING EFFICIENCY** — Added momentum of spindle-mounted flywheel assures longer cutter life and greater efficiency, through smoother, more positive drive — a key to most efficient use of modern cutting tools. Spindle rigidly supported by Kearney & Trecker's original 3-bearing design.



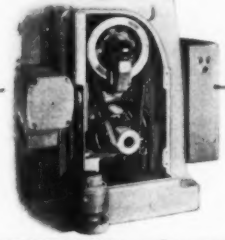
**GREATER ADAPTABILITY** — No. 60 Heavy Duty drive flange on Nos. 4, 5 and 6 machines enables use of heavy duty arbors with flange drive for large single or multiple cutter setups; or bolting large face-milling cutters directly to spindle nose. Average setups use standard arbors with No. 50 spindle drive.

**NON-GLARE RAPID-SET DIALS** — You'll avoid costly errors in reading and setting these new micrometer dials. They're vapor blasted to give you a non-glare satin surface with plenty of contrast for legibility of markings. They're easy and quick to set and provide a positive lock at every setting.

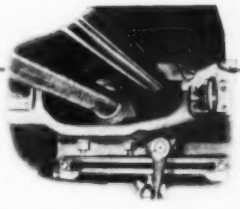


**GREATER PRODUCTION AND GREATER OPERATING CONVENIENCE** — Production men will like Mono-Lever Control because it reduces idle cutter time, shortens floor-to-floor cycle time. Operators will like it because it makes faster, simpler, less fatiguing work for them.

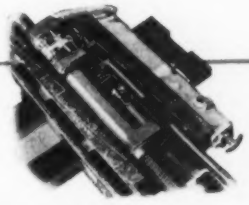
**FEEDS AND SPEEDS TO TAKE FULL ADVANTAGE OF MODERN CUTTING TOOLS** — and you really can do it with the broad feed and speed ranges on Kearney & Trecker's new CK milling machines. You get 24 spindle speeds (15 to 1500 rpm on Nos. 2 and 3, 13 to 1300 rpm on Nos. 4, 5 and 6) with Kearney & Trecker's automatic protecto-mesh shift to eliminate gear clashing. And there's the extra-wide feed range — 32 changes from ¾" to 90" per minute—with separate 3 or 5 hp feed and rapid traverse drive.



**GREATER HORSEPOWER** — where you need it. That's what you get with new CK independent motor drives for spindle and for feed and rapid traverse. Depending on machine size (Nos. 2, 3, 4, 5 or 6), machines range from 10 to 25 hp for spindle drive and 3 to 5 hp for feed and rapid traverse.



**SMOOTHER FEED PERFORMANCE** — with a new design 2" diam. heavy-duty, table feed screw that affords greater bearing contact and runs through an extra-long table feed nut. These new CK machines are equipped with a backlash eliminator for more effective climb milling, more accuracy and longer screw life.



**GREATER MACHINE LIFE** — through automatic lubrication and generously proportioned gears and shafts throughout for overload conditions. There's a forced flood system in the column and knee, and a positive metered, pressure pump system for table, saddle and knee ways, and table feed assembly.

Kearney & Trecker's new CK Line is designed to meet every demand of present-day milling operations . . . making CK machines more accurate, and MORE PRODUCTIVE for you. Contact your nearest Kearney & Trecker representative or write direct to obtain complete specifications of these fine new machines. See how they easily replace obsolete machines at substantial savings to you. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

**investment that makes both Dollars and Sense.**

**UNOBSTRUCTED PRODUCTION AREAS** like the one around these Danly Underdrive Presses are a feature of underdrive press installations—and typical of the efficient working conditions found in the new Buffalo Stamping Plant of the Ford Motor Company.

**FINISHED STAMPINGS** are removed from the press automatically here, at the end of the line by an automatic unloading device. This mechanical handling, or "Automation," is a bold development for increased material handling efficiency.

# Producing Big Stampings Faster with DANLY UNDERDRIVE at FORD'S new Buffalo Stamping Plant

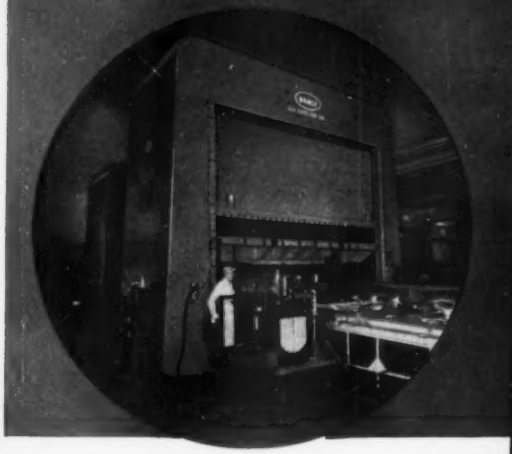
Uninterrupted press operation and speedy, efficient material handling are vital in the production of large automobile body stampings. Big Danly Underdrive Presses like these fill the bill in the huge new plant of the Buffalo Stamping Division, Ford Motor Company.

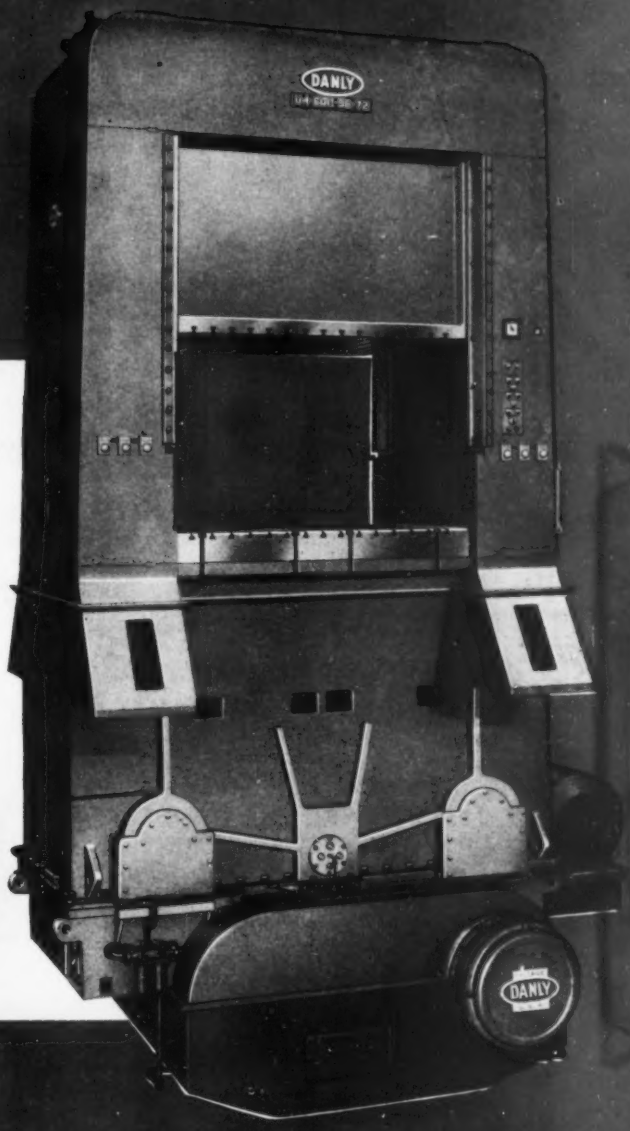
Danly Underdrive Press design provides maximum head room for crane ways, extra clear working space to facilitate material handling, and keeps nearly all service and maintenance operations on a separate sub-floor level, clear of the production area. In addition, Danly features like the exclusive Danly Cool-Running Clutch and pressure lubrication monitored by a safety switch automatically assure steady, dependable performance under the punishment of continuous high speed production.

Call a Danly Press Engineer today for a specific discussion of the advantages of Danly Presses on *your* production line.

DANLY®

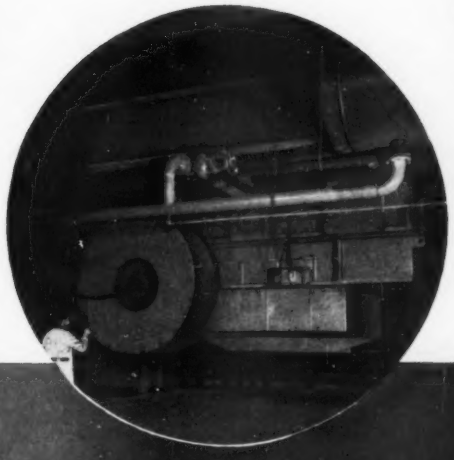
IT COSTS LESS TO RUN A DANLY PRESS






**WORKING LEVEL VIEW** of a Danly 1000 Ton Underdrive Press performing a piercing operation on front floor pans for Ford production. These big stampings are automatically conveyed to the dies by Ford "Automation."

# PRESSES



**SUB-FLOOR VIEW** of Danly Underdrive Press showing clear working space for service and maintenance construction of the working area above is necessary. Note the outboard mounted position of the Danly Cool-Running Clutch, simplifying maintenance and further

**CLEAN FUNCTIONAL DESIGN** gives the production floor area, working around open side presses to all main working parts from the sub-floor level speeds servicing. Friction disc type lining in Danly Cool-Running Clutches and brakes can be completely replaced in less than 30 minutes.

**DANLY MACHINE** [illegible]

2100 South Laramie Avenue, Chicago 50, Illinois

# No Chatter!

## ...and no rough holes...when you use MORSE REAMERS with Staggered Flutes

If you want a hole sized accurately, *then you want Morse Reamers.* For the staggered spacing of the flutes ends all chance of "biting and slipping"... gives you completely new ideas about smooth cutting and accurate hole-sizing. And no monkey business!

One of the stars in the Morse Reamer line is the famed Morse Expanding Chucking Reamer ... which can be reground and reground, each time it finally wears below size. Cutting head is super-high-speed steel, butt-welded to a Straight or Morse Taper Shank. *By this design, tool life is multiplied many times.* And if you want *even longer* tool life, ask for "Morse Electrolized."

But Morse makes *all types of reamers.* And if you want Morse Quality ... both in tools and results ... then you've *got* to buy Morse Reamers. Your Morse-Franchised Distributor is the sole purveyor of Morse Quality in your territory. *Call him now!*

**Morse Twist Drill & Machine Company**
NEW BEDFORD, MASS.
(Div. of VAN NORMAN CO.)
*Warehouses in New York, Chicago, Detroit, San Francisco*

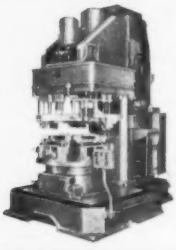
# MORSE

## Cutting Tools

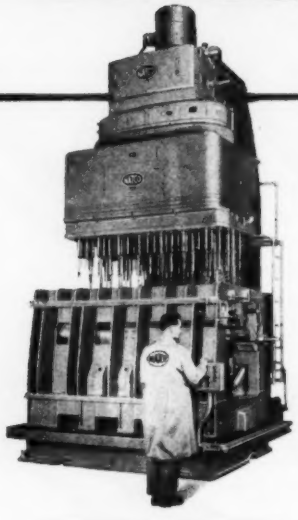
MORSE
MORSE
MORSE
MORSE

# 50 Years Experience

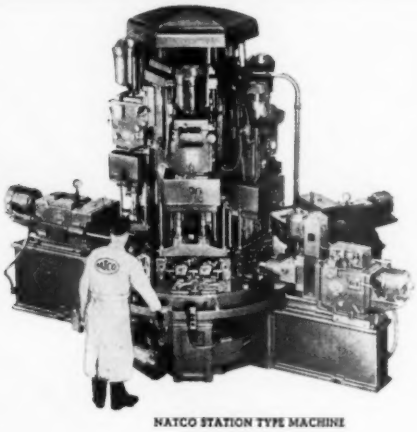
NATCO LIGHT SENSITIVE
DRILLER AND TAPPER



NATCO HOLESTEEL ADJUSTABLE
DRILLER AND TAPPER



NATCO HEAVY DUTY HOLESTEEL DRILLER



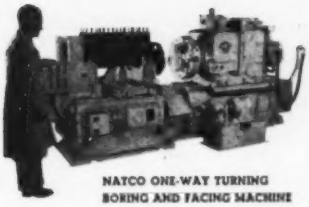
NATCO STATION TYPE MACHINE

**Out of the past fifty years of NATCO experience has come a deeper understanding of today's engineering and production problems. By reason of this maturity of understanding the NATCO organization is better equipped to help you solve your drilling, boring, tapping and facing problems. Better equipped with experienced engineers and designers. Better equipped with the most complete range of adjustable and fixed center multi-spindle machines in the world.**

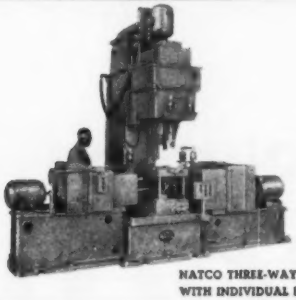
**A few of the various NATCO machines are illustrated above. As you can see they range from small, fast, light-sensitive multi-drillers and tappers to large automatic processing machines . . . from single spindle to an unlimited number of spindles, from one direction to any number of directions, vertical, horizontal or angular, special or standard and operations range from 1/16" drill to 14" or larger bore. The materials worked include iron, steel, bronze, aluminum, wood and plastic.**

NATCO HIGH SPEED SENSITIVE DRILLER AND TAPPER

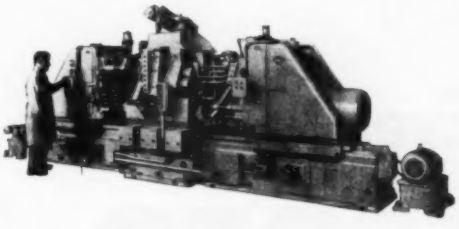
NATCO HIGH SPEED SENSITIVE UNIT



NATCO ONE-WAY TURNING BORING AND FACING MACHINE



NATCO THREE-WAY TAPPER WITH INDIVIDUAL LEAD SCREW



NATCO THREE-WAY TRUNNION TYPE DRILLING MACHINE

NATCO HOLEWAY AUTOMATIC PROCESSING MACHINE

**Today NATCO offers you not only fifty years experience and ample production facilities but also several branch offices conveniently located to serve you in Detroit, Chicago, Buffalo and New York City.**

**To solve your problems in drilling, boring, facing and tapping most economically . . . Call a NATCO Field Engineer Today!**

*Golden Anniversary*

1901 NATCO 1951

*Have you a Military Job for this Special Counting Mechanism?*

*. . . then you will find out what we mean when we say. . .*

# Everyone Can Count on VEEDER-ROOT

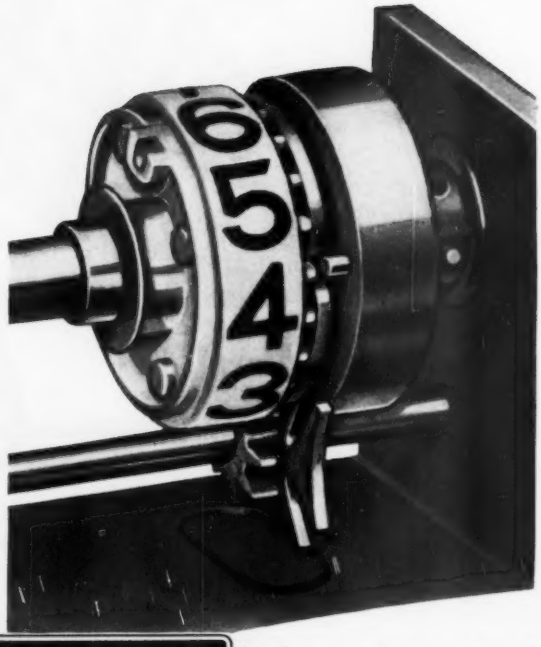
You're looking at a new *and patented* development... featuring the Veeder-Root "Geneva Transfer"... designed for higher speeds and easier readability from a distance.

Here's another vitally important Veeder-Root "first," for use in military equipment. And within the understood limitations of the present-day rule of "first things first" . . . what can we *figure out* for you?

VEEDER-ROOT INC.

HARTFORD 2, CONN. • GREENVILLE, S. C.
Montreal, Canada Dundee, Scotland

*Offices and agents in principal cities*




**VEEDER-ROOT COUNTERS** *"Count Everything on Earth"*

Yesterday
76
MINUTES

Today
34
MINUTES

# "AMERICAN"
# HYDRAULIC DUPLICATOR

## *The Latest COST CUTTING Sensation*

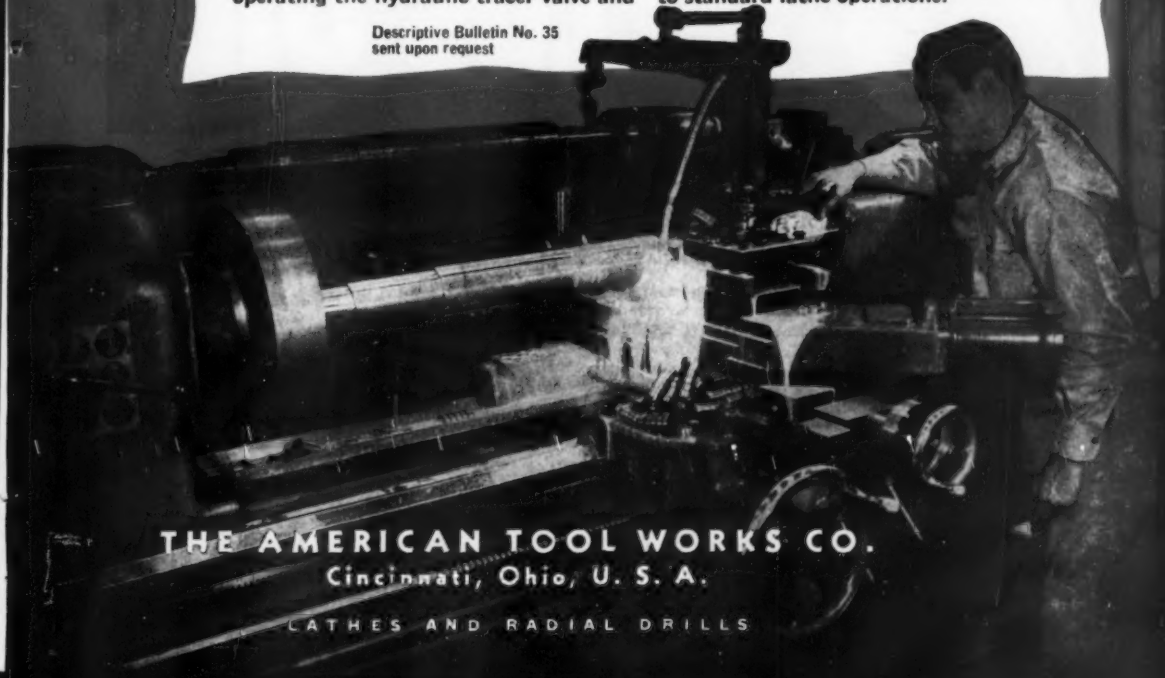
Here's a job that's being done in 34 minutes, floor to floor. This includes a finishing cut to reduce grinding time to a minimum. It formerly took 76 minutes to turn and 50% longer to grind.

This marvelous machine will reproduce steps, tapers, right angle and tapered shoulders, recesses, grinding necks and radii and is especially adapted to the production of such work as spindles, motor shafts, valve stems, back shafts, piston rods and axles. It will also accommodate a wide variety of chuck work having irregular contours.

A single hydraulic system is employed for operating the hydraulic tracer valve and the piston which controls the movement of the tool slide carrying the cutting tool. This simplicity is an outstanding feature and insures accurate reproduction, freedom from failures and elimination of work rejects. This new metal cutting technique permits continuous cutting without interruption for measuring or calipering at feeds and speeds to the cutting limit of Cemented Carbide tools. "Miking" on shaft work is confined to the first diameter only after which all other diameters are secured automatically.

This machine may be quickly converted to standard lathe operations.

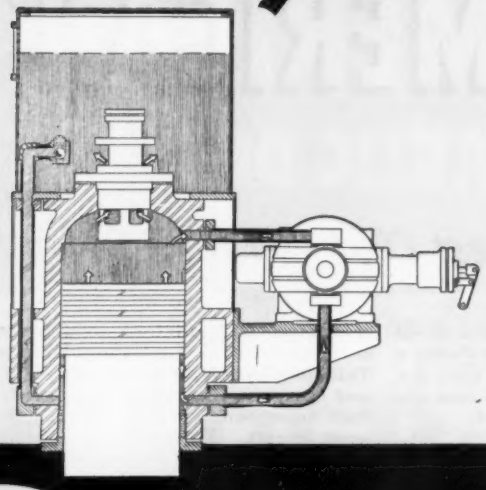
Descriptive Bulletin No. 35
sent upon request



THE AMERICAN TOOL WORKS CO.
Cincinnati, Ohio, U. S. A.

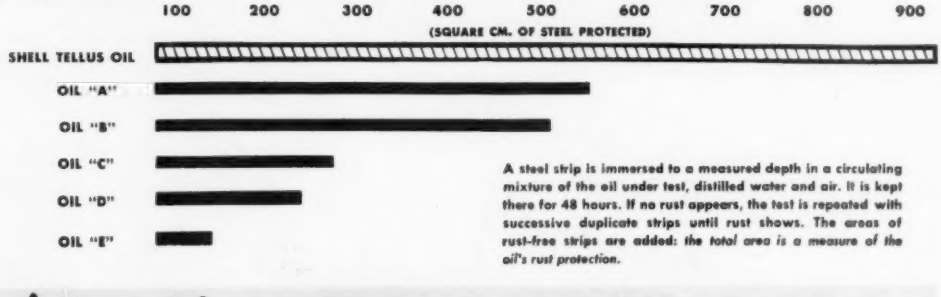
LATHES AND RADIAL DRILLS

# Today's surest ...for



## Improved SHELL TELLUS OIL

### LOOK AT THIS RUST-INHIBITION TEST




A steel strip is immersed to a measured depth in a circulating mixture of the oil under test, distilled water and air. It is kept there for 48 hours. If no rust appears, the test is repeated with successive duplicate strips until rust shows. The areas of rust-free strips are added: *the total area is a measure of the oil's rust protection.*

## Improved SHELL TELLUS

# *protection—*

# Hydraulic Equipment

## The one fluid that:

### *1. Prevents Rusting*

With a new combination of inhibitors, the result of eight years' continuous research and operating tests. The chart on opposite page graphically illustrates the wide margin of superiority with which this new oil protects against rust.

### *2. Excels in Oxidation Stability*

Improved Shell Tellus Oils have even greater resistance to the formation of harmful oxidation products than previously. The specially developed oxidation inhibitor in Improved Shell Tellus Oils enables these oils to far exceed accepted service life. Service records for dozens of hydraulic machines of many types prove outstanding stability with respect to oxidation and sludge formation. You can be confident that sludging will not be a problem in any of the vital parts of your equipment.

### *3. Reduces Foaming*

An effective anti-foam agent provides freedom from foaming caused by the inclusion of air or gases in the hydraulic oil. Thus, a smooth operating system can be realized at all times. Minor air or gas leaks can be tolerated for considerable periods, thus avoiding unscheduled shutdown.

### *4. Prevents Wear*

Because of its outstanding ability to penetrate between closely fitting surfaces, and to maintain a tenacious film at all times, Improved Shell Tellus Oil keeps wear at a minimum. The high film strength persists through variations in pressures and temperatures encountered in hydraulic systems.

### *5. Has Highest Demulsibility*

Improved Shell Tellus Oil provides freedom from emulsions. Experience in service proves a rapid separation from water, even with unusually "wet" systems.

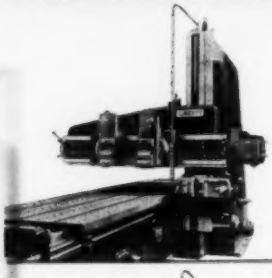
---

**You are invited to write for full information on Improved Shell Tellus Oil. Samples are available for your tests. Write: Shell Oil Company, 50 West 50th Street, New York 20, N. Y. or 100 Bush Street, San Francisco 6, California.**

SHELL

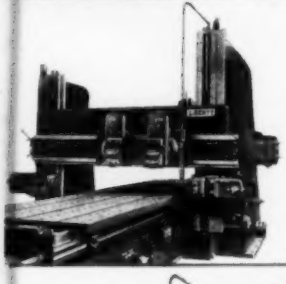
**OIL** *for all Hydraulic Machinery*

# LIBERTY BUILDS 3 *great* PLANERS



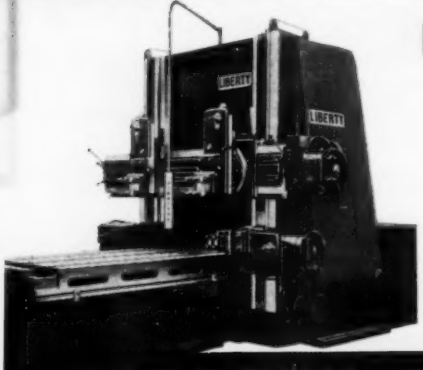
## OPEN SIDE

For shops handling work of variable widths. Wide-faced housing and motorized clamp give rigidity for heavy roughing cuts and finishing. Dual control; electric feeds; rapid traverse to all Heads in all directions.



## CONVERTIBLE

For exceptional rigidity on variable widths. Two, three or four heads. Offset heads permit closest approach of tools. Double balanced driving gear and pinions. Extreme accuracy.




## DOUBLE HOUSING

For rapid production combined with accuracy. Two, three or four heads. Extremely rigid; handles production work with maximum cutting feeds and speeds. Table pulled into tool. Electric clamping and dual control for ease of operation; high production.

***Write for catalog giving complete details.***

**All lengths, 24" x 24" wide and larger.**

**LIBERTY PLANERS, INC.**
**HAMILTON, OHIO**

**GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 W. MADISON ST., CHICAGO 6**
***Exclusive Representatives in All Principal Cities***

# Smooth Starting of Squirrel Cage Motors—

## use one of these 6 Reduced Voltage Starters

To prevent damage to many machines or to materials in process, squirrel cage motors often need gradual acceleration. For such applications, one of these reduced voltage starters will provide the desired speed-torque control.

This line of A-B starters is extremely versatile, providing either manual or automatic starting . . . with 2 or 3 step acceleration . . . or stepless control up to full speed . . . to fit the most critical motor starting requirement.

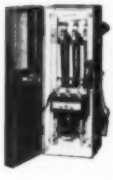
### MANUAL—TRANSFORMER TYPE

Manual transformer type starter up to 125 hp, 220 v; 250 hp, 600 v max. Air break or oil immersed contacts. Automatic reset overload relays. Time delay mechanism determines proper time interval for manual switch-over of hand lever.

**BULLETIN 646**

### MANUAL—COMPRESSION TYPE

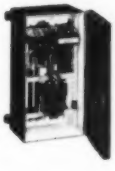
Manual compression resistance starter up to 50 hp, 220-600 v max. Graphite discs in the insulated tubes are compressed with the hand lever for stepless speed control. Ideal starters for chain or belt drives. Overload relay protection.



**BULLETIN 640**

### AUTOMATIC—3 STEP RESISTANCE

Automatic resistance starter up to 400 hp, 220-600 v max. Accelerates squirrel cage motors in 3 steps. Resistors easily adjusted for ideal starting of motors on power networks. For more than 3-point control, use Bulletin 742 starter, below.



**BULLETIN 741**

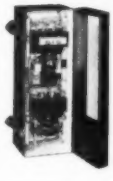
### AUTOMATIC—TRANSFORMER TYPE

Automatic reduced voltage starter up to 300 hp, 600 v max. An accurate timing relay controls the accelerating time. Operator touches start button—the starter does the rest. Available in standard, watertight, and dusttight enclosures.

**BULLETIN 746**

### AUTOMATIC—2 STEP COMPRESSION

Automatic resistance starter with preset adjustable graphite resistors up to 250 hp, 220-600 v max. Push button closes starting circuit through resistors. Later, timing relay closes running contactor and cuts out the starting resistors.



**BULLETIN 740**

### AUTOMATIC—STEPLESS TYPE

Fully automatic resistance starter with solenoid controlled graphite disc resistors rated up to 500 hp, 220-600 v max. Stepless control of current and speed. Acceleration adjustable to avoid lamp flicker. Overload relay protection.

**BULLETIN 742**

*Write for Bulletins* to Allen-Bradley Co., 1316 South Second Street, Milwaukee 4, Wisconsin

A-B Quality

**ALLEN-BRADLEY**

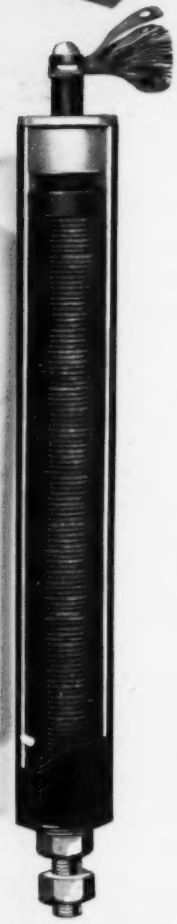
REDUCED VOLTAGE STARTERS

QUALITY

351-MR

# for VELVET SMOOTH ACCELERATION

## use these Allen-Bradley Starters with Graphite Compression Resistors



Cutaway view of Allen-Bradley graphite resistor tube showing discs, insulating lining, and the pressure terminal.

With these Allen-Bradley compression resistance starters you can start squirrel cage motors with such velvet smoothness that there is no voltage dip . . . no lamp flicker. The secret of this stepless acceleration lies in the smooth control of the Allen-Bradley graphite compression resistors which are shown below.

**BULLETIN 640 MANUAL**
**Stepless Resistance Starter**

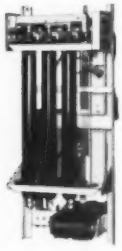
The motor current passes through the graphite disc resistors. Compressing them with the hand lever reduces the starting resistance steplessly until it is shunted automatically by the running contactor.

Bulletin 640 manual starters have a hand lever for manually compressing the resistors. At maximum speed position, a magnetic contactor automatically connects the motor to full voltage.

**BULLETINS 740 & 741 AUTOMATIC**
**2 and 3 Step Resistance Starters**

In these two resistance starters the adjustable resistors are arranged in 2 or 3 steps. Each step is cut out, successively, by timing relays. These starters can be easily adjusted for equal current inrush per step.

Bulletin 740-741 starters are rugged, automatic starters.



**BULLETIN 742 AUTOMATIC**
**Stepless Resistance Starter**

In this starter, compression of the graphite discs is done automatically by a solenoid mechanism. Absolutely velvet smooth acceleration is obtained. No other starters provide similar stepless control.

Bulletin 742 resistance starters prevent lamp flicker on network systems. They provide automatic stepless starting for machines and processes which are easily damaged by sudden starting.

**BULLETIN 646 TRANSFORMER TYPE STARTER**

For loads with high starting friction, requiring sudden applications of power, use the Bulletin 646 manual or the Bulletin 746 automatic transformer type starters.

***Write for Bulletins*** to Allen-Bradley Co., 1316 South Second Street, Milwaukee 4, Wisconsin

**ALLEN-BRADLEY**
**REDUCED VOLTAGE STARTERS**
**QUALITY**

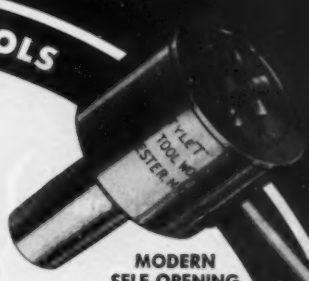
A-B Quality

351-MR

# MODERN PRECISION TOOLS

MODERN COLLAPSIBLE TAPS

Modern Self-Opening Die Heads are available in both stationary and rotary types. The stationary type is made in a range of sizes with capacity for cutting straight threads from ⅛" to 7", and ⅛" to 6" for pipe threads. Rotary type, straight threads from ⅛" to 1¼", pipe threads from ⅛" to ¾".



MODERN SELF-OPENING DIE HEADS

Of unusually simple design with a minimum number of parts and no complicated mechanisms, this new Modern Collapsible Tap Style A-A helps meet industry's demand for faster, lower cost production. It is made in a wide range of sizes with adequate capacities for cutting straight threads and straight and taper pipe threads. All parts are of properly hardened steel, ground and precision fitted.

MODERN-MAGIC CHUCKS AND COLLET EQUIPMENT

Modern-Magic Quick Change Chuck and Collet Equipment virtually eliminates costly idle time usually present in revolving spindle operations. Tools are changed without stopping or even slowing the spindles. Modern-Magic Chucks are made in 6 sizes and two types: friction drive and positive drive. Modern-Magic Collets are available in a broad range of both standard and special types.

Modern Self-Opening Stud Setters are positive and entirely automatic in action, and can be operated in any position with either air or electrically driven portable tools. Also equally effective in drill presses where it is possible to drill and tap the holes and set the studs in successive operations. Made in two sizes ½" and ⅞" capacity.

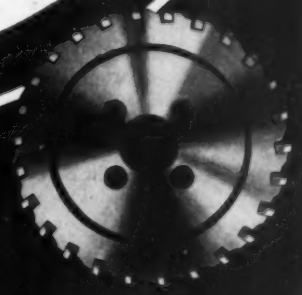
Modern Medium Duty Face Milling Cutters are of blade backed design, and are made in axial and radial types. Standard Modern axial type cutters are available in diameters from 4" to 24". Standard radial type cutters from 8" to 24" diameters. All blades, wedges and screws are interchangeable in all Modern Cutters regardless of diameters.

***Detailed information covering any Modern Precision Tool in which you are interested will be furnished promptly upon request. Let us show you how Modern Precision Tools can help to speed up your production and reduce your costs.***

**Modern Precision Tools Include . . . . .**

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

MODERN SELF-OPENING STUD SETTERS



MODERN FACE MILLING CUTTERS

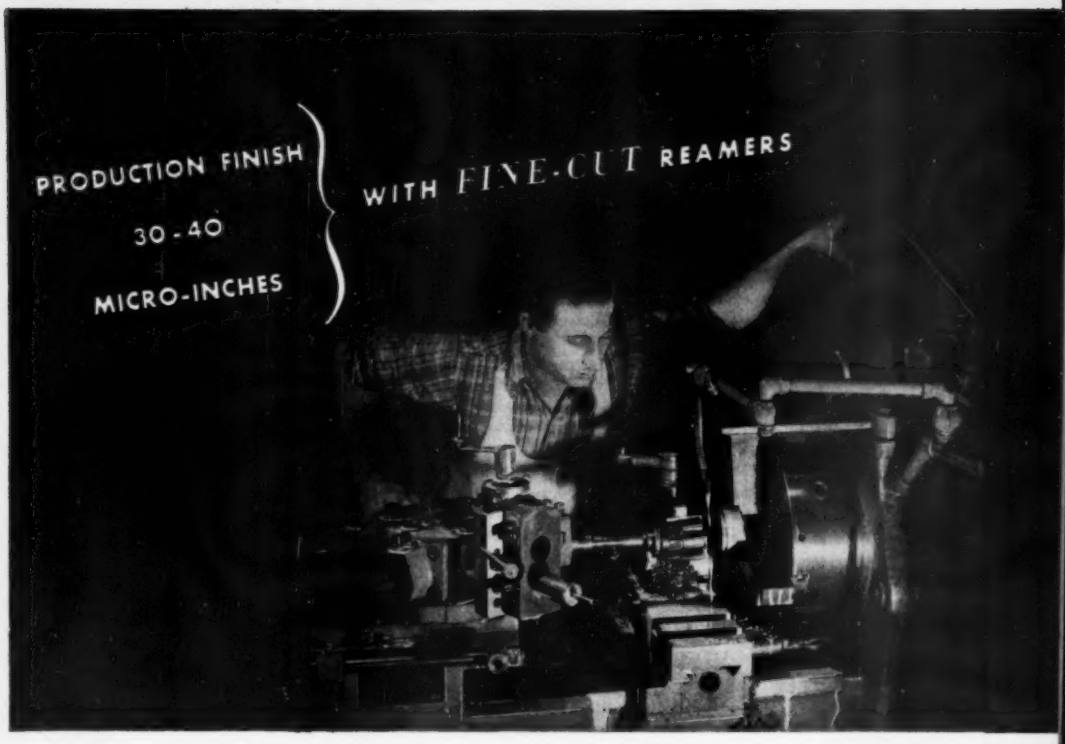
**Modern Precision Tools are produced by the originators of the Modern-Magic Quick Change Chuck and Collet Equipment.**

# MODERN TOOL WORKS

DIVISION OF

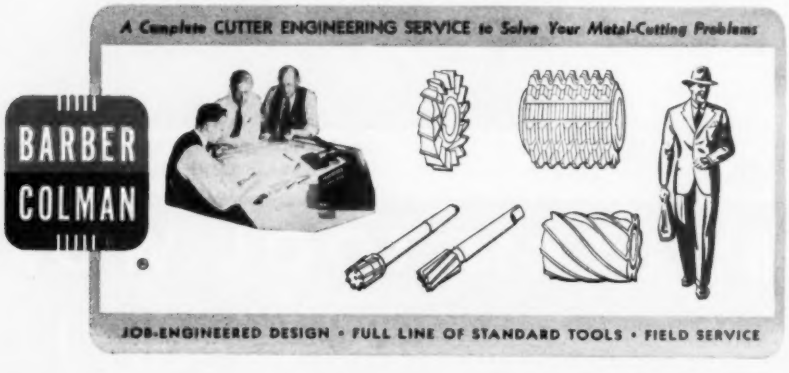
CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK




You can ream finishes like this in *regular production* operations with Barber-Colman Fine-Cut Reamers. Many jobs which previously required finishing by lapping or honing are now being finish reamed with these Fine-Cut reamers. All elements for fine finish, accuracy and tool life are provided in the reamer design and application of Barber-Colman job-engineered reamer sharpening.

With assurance of this built-in control, more pieces can be finish-reamed before breaking the set-up for re-sharpening. In addition, the Barber-Colman blade mounting design combines outstanding tool life with ease of blade adjustment and absolute rigidity. That's why you outproduce — and outearn — conventional tool designs every time with Barber-Colman reamers.


A Complete CUTTER ENGINEERING SERVICE to Solve Your Metal-Cutting Problems
BARBER
COLMAN
JOB-ENGINEERED DESIGN • FULL LINE OF STANDARD TOOLS • FIELD SERVICE

# Barber-Colman

## FINE-CUT REAMERS

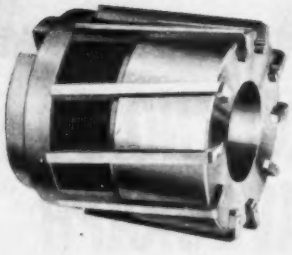
### ONE-CUT FINISH REAM 30-40 MICRO-INCH FINISH, CUTTING 170 FEET PER MINUTE, USING .008" — .010" FEED

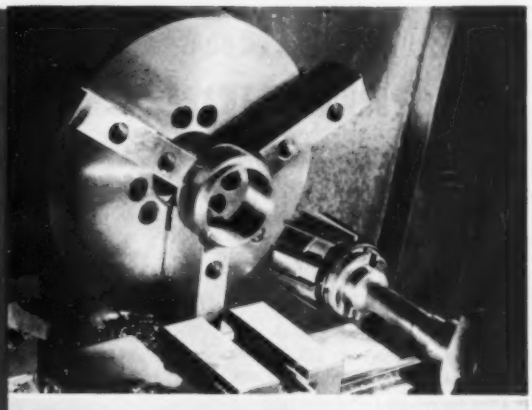
No special tooling is required to get results like these. A standard turret-lathe set-up is used. The large number of blades in the reamers provides extra stability in the cut and smaller chip load per tooth, resulting in a very fine finish.

Front chamfer, secondary lead and back taper are specified for these particular job conditions by Barber-Colman Reamer Engineers to produce free-cutting and easy chip removal without scratching, back scoring or gouging.

If you are now choosing between accurate, quality-finish reamed holes — and low-cost production and reamer maintenance — you can have both, using Barber-Colman adjustable reamers. More blades per cutting diameter — blades solidly held in cutting position — Barber-Colman standard irregular blade spacing — these features produce tool room quality under production reaming conditions.

Send specifications on hole sizing and finishing problems to Barber-Colman engineers. They will furnish reamers to give you the desired quality consistently.





**1.** Reamer, held in turret lathe float, is fed to work revolving at 170 feet per minute, using .008"-.010" feed. Three thousandths stock is removed in a cut 2.88" diameter and 1-1/2" long.

**2.** Irregular spacing of ten reamer blades is arranged so that diameter size is easily checked across any two blades. Wedge mounting at bottom of blades permits more blades per reamer diameter — hence, finer finish.

**3.** Consistent 30-40 micro-inch finish is obtained on these precision boring head collars throughout the life of the reamer because of Barber-Colman job-engineered reamer sharpening.

**Barber-Colman Company**

GENERAL OFFICES AND PLANT, 515 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

# AIRCO ACCURACY... PRECISION ... OPERATING ECONOMY

***designed into the all new***

# AIRCO NO. 50 TRAVOGRAPH

## GAS CUTTING MACHINE

Airco's NEW No. 50 Travograph is a rugged, all-welded gas cutting machine. Its massive, long-lived design is engineered to give fingertip sensitivity to all production operations. Used as a basic tool for multi-torch shape cutting, squaring or beveling, its outstanding accuracy slashes reject loss and working costs to a minimum.

Today's most modern production tool, the rugged new Airco No. 50 Travograph precision-cuts steel—light plates, heavy slabs, billets, forgings—to close tolerances. Here are the reasons for its remarkable exactness . . . the "why" it guarantees faithful reproduction.

1. All-welded construction provides a combination of ruggedness, resistance to vibration, and precision operation.
2. Rigidity built into the torch-bearing pantograph arms enables the torch bar to support a uniform load of *500 lbs!*
3. Perfectly-balanced when properly set on 16′ rails.
4. Ball bearings in the hinge joints make it extremely smooth operating.

For greatest operating flexibility, the new No. 50 Travograph can be equipped with three distinctly different tracing devices—manual, magnetic, or the full-automatic "Electronic Bloodhound". The "Electronic Bloodhound" needs only an outline drawing or silhouette to cut the most intricate shapes smoothly, sharply, quickly . . . and with extreme accuracy.

If your production line requires quantity flame shaping operations . . . and if close precision cutting would lower your finish-machining costs . . . it will pay you to investigate Airco's new No. 50 Travograph. For complete information write your nearest Airco office for the new catalog just coming off the press.

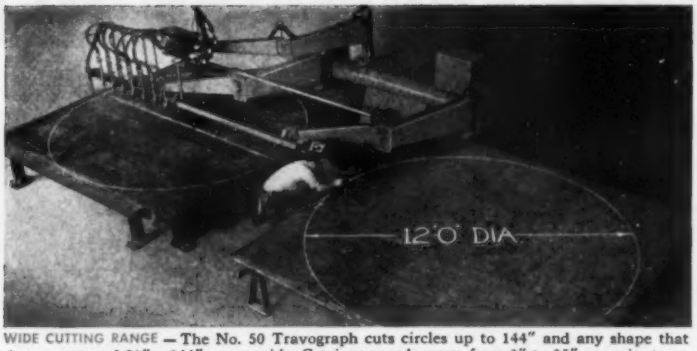
AIRCO

**AIR REDUCTION**

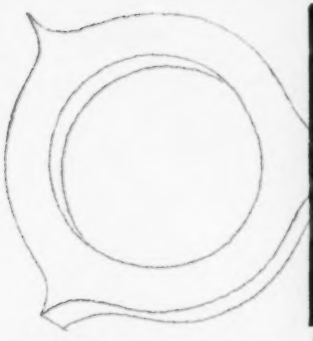
*Divisions of Air Reduction Company, Incorporated*

*Offices in Principal Cities*

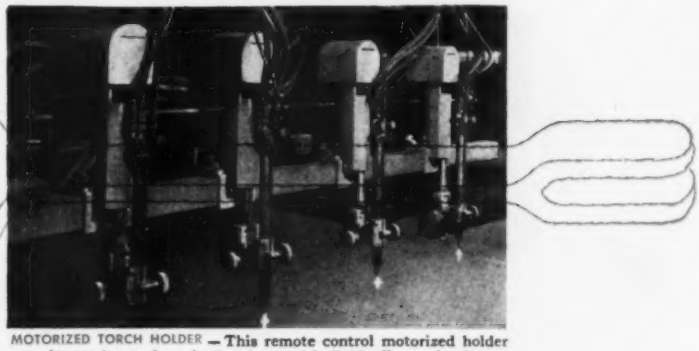
AIR REDUCTION . . . PIONEER



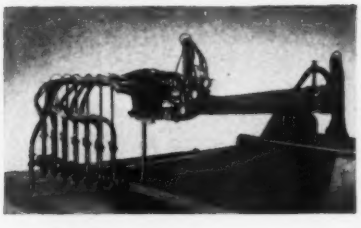

WIDE CUTTING RANGE — The No. 50 Travograph cuts circles up to 144" and any shape that does not exceed 92" x 144" on one side. Carriage speeds range from 2" to 35" per minute on the low side; 10" to 168" on the high side, permitting a wide cutting range and allowing high speed positioning over the work.

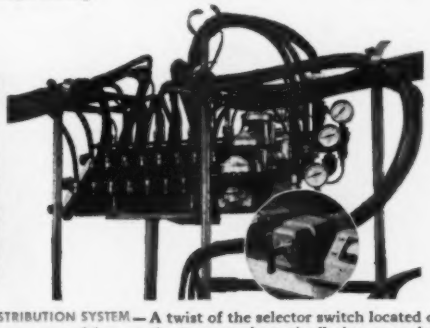


SELF-SUPPORTED MANIFOLD — This individual pantograph arm supports the entire weight of the gas distribution equipment, and is guided by the tracer bar, so that the manifold-torch relationship remains constant. The useful load capacity of the tracer bar is greatly increased because it carries no gas equipment except torches.



MOTORIZED TORCH HOLDER — This remote control motorized holder permits torches to be raised or lowered individually or simultaneously. Fingertip regulation by the operator allows close control of the space between the cutting tip and the material. Torches may be raised or lowered when bevel cutting without upsetting the bevel angle setting.





GAS DISTRIBUTION SYSTEM — A twist of the selector switch located on the remote control box at the "operator's station" gives complete control of preheating gases and cutting oxygen. This operates one to eight torches, and assures a properly adjusted flame for repetitive cutting operations. This remote control is made possible by solenoid operated valves located on the manifold.

DESIGNERS OF FLAME CUTTING MACHINES FOR EVERY PURPOSE

# Your Source of 30,000

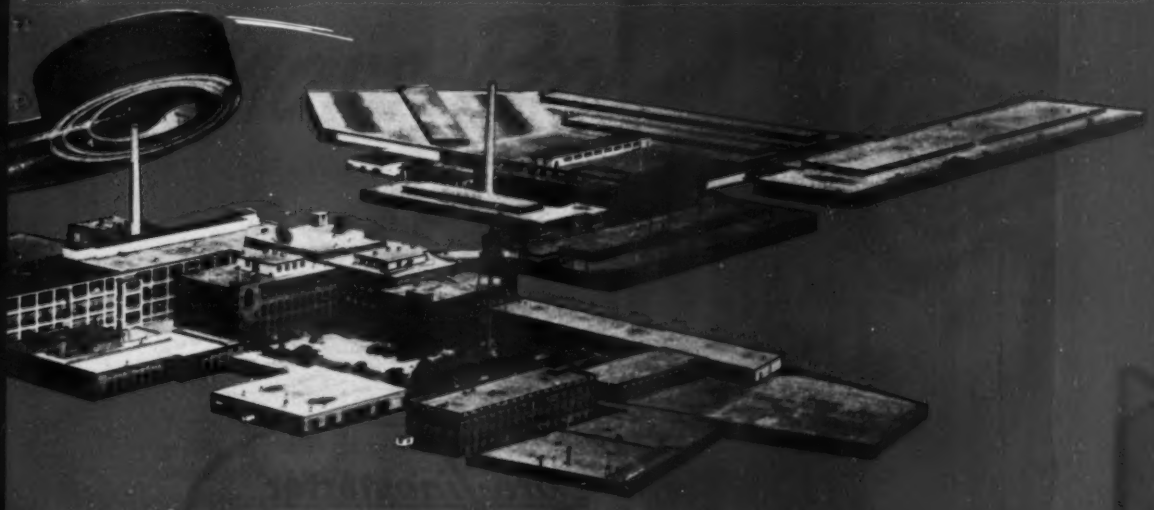
BEHR-MANNING

NORTON abrasives

# BEHR-MANNING

COATED ABRASIVES · SHARPENING

# COATED ABRASIVE PRODUCTS



**BEHR-MANNING PRODUCES EVERYTHING YOU NEED IN COATED ABRASIVES**

A statement like that takes in a lot of territory . . . but we can go even farther and say that BEHR-MANNING produces coated abrasive products that you *may not now know that you need*, but which if used in your production processes may well bring you important additional profits. For within the 30,000 coated abrasive products mentioned above, some are very new and their possibilities not yet generally realized.

Within the past seven years, BEHR-MANNING research and development engineers have brought out and field tested *58 entirely new abrasive products*. In the same period they have achieved *235 product improvements*. This process is continuous — BEHR-MANNING research never stops.

TO MAKE SURE that your grinding and polishing methods are *right* for your needs — utilize the BEHR-MANNING Methods Room located nearest you. Take advantage of the abrasive engineering experience available there, without obligation. Try out the latest abrasive methods on your own work.

Full details on this free service, and location of Methods Room nearest you, are covered in the book, "Proving Ground for Production." Write for your copy today. Address Dept. AM-5.

BEHR-MANNING

TROY, N. Y. DIVISION OF NORTON COMPANY

STONES · PRESSURE-SENSITIVE TAPES

EXPORT: BEHR-MANNING OVERSEAS INC., NEW ROCHELLE, N. Y., U. S. A.

Life-Linestarter
PAIRED FOR PRODUCTION
Life-Line motor
DO NOT LUBRICATE

# *Mass Production?*

## Assures schedules two ways

When motors—or their controls—go out, they usually go one at a time. One outage, though, may cripple an entire line. And whether you are producing spark plugs, automobiles or tanks, down time means lost production time. Take just a minute, then, to consider the extra "Life" features of Life-Line motors and Life-Linestarters®. They have the stamina to keep equipment operating under adverse conditions.

Consider the motor, for example. Heavy steel frame resists corrosion, vibration and physical shock. And inside? The wound stator is completely protected with multiple baked coats of tough thermoset varnish to cut outages from oil, moisture, dirt and heat.

And, too, Life-Line motors need no lubrication. Factory-sealed, pre-lubricated bearings reduce motor burnouts—no danger of over-or-under-lubrication as with conventional motors. Down time licked again.

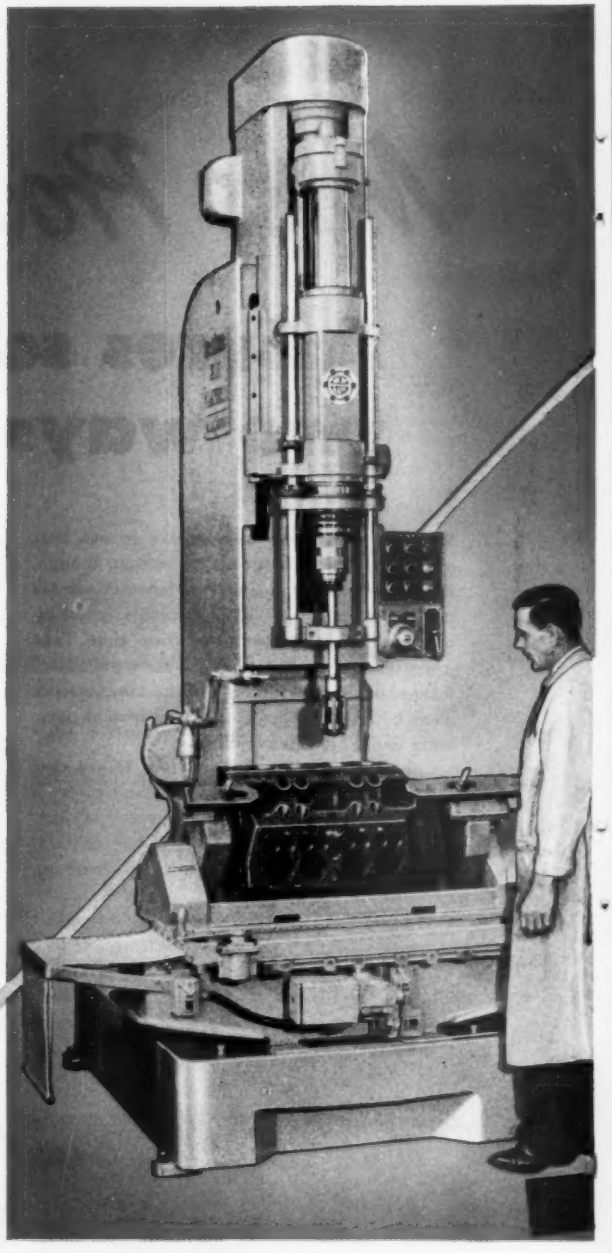
Life-Linestarter, the Life-Line motor's rugged partner, provides positive protection on the toughest assignments. Designed specifically to meet the requirements of the Joint Industrial Committee of Automotive Manufacturers (JICAM), the combination Life-Linestarter in NEMA XII enclosure is provided with a dual-voltage primary transformer for operation on either 220 or 440 volts. The rubber-gasketed, no-knock-out enclosure excludes dirt, oil and splashing coolant.

Simple design, simple operation, mean fewer operating parts to foul. Seesaw action of clapper prevents accidental operation, kickout spring assures positive opening. The pace setter among starters, Life-Linestarter assures the dependable performance you need.

More data? Ask your Westinghouse representative for "Life-Line Motor Book" B-3842 and "Tomorrow's Starter Today" B-4677, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-21640

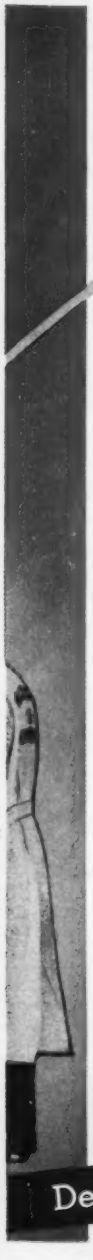
YOU CAN BE SURE.. IF IT'S
Westinghouse
Life-Line
MOTORS and CONTROLS

# Want Smoother, Cooler Honing?



# SINCLAIR LUBRICANTS AND

**For lubrication counsel, get in touch with your nearest Supplier of Sinclair Products**



## Sinclair HONOL efficiently carries off heat and swarf... helps produce a finer finish

What coolant will best get rid of heat, to prevent discoloration, distortion? What fluid will best carry off chips and swarf, to avoid filling up of abrading sticks, glazing, scoring, scratching?

Sinclair specialists designed HONOL to solve these exacting requirements. And users report highly satisfactory results with this fine, ready-mixed honing fluid.

If you want greater accuracy and fineness of finish — join the others who are profiting with Sinclair HONOL. It is available in several grades, all ready for use.

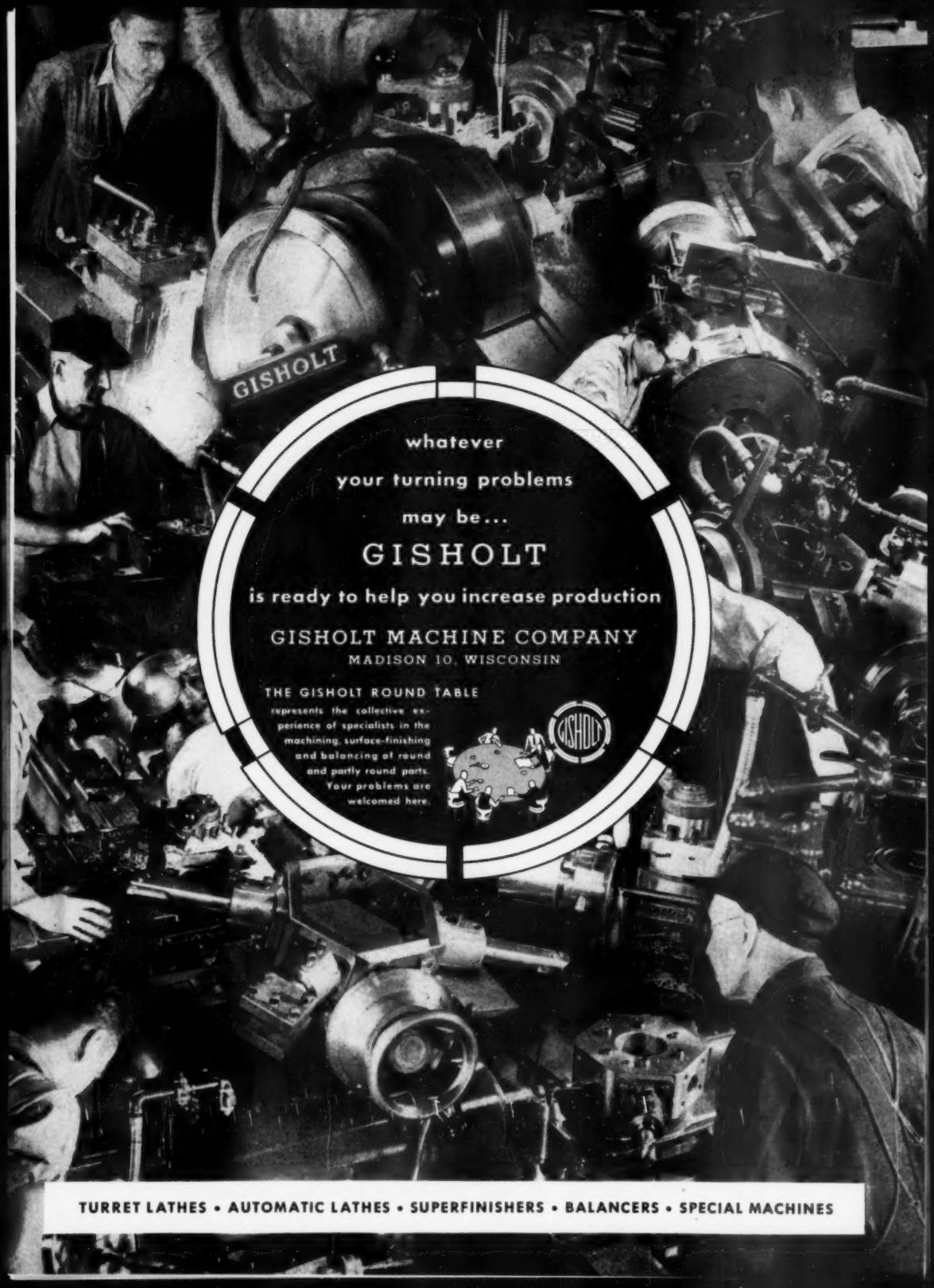
Promotes Effective Stock Removal

Decreases Stone Wear

Carries Away Heat

# COOLANTS...for metal working

or write direct to Sinclair Refining Company, 630 Fifth Avenue, New York 20, N.Y.


GISHOLT
whatever
your turning problems
may be...
GISHOLT
is ready to help you increase production
GISHOLT MACHINE COMPANY
MADISON 10, WISCONSIN
THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.
GISHOLT
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

# CARD Spiral Pointed TAPS

## *Cost no more...yet they're double-checked!*

Card Spiral Pointed Taps are thoroughly factory-inspected, of course. But every so often the Pittsburgh Testing Laboratory buys them on the open market, then *re-checks* them—as it does with all Card Taps—and certifies the results.

We do this to make sure that the Card Taps you buy will perform better and last longer. That's why it always pays to specify Card Certified* Taps. They're double-checked for your protection — *yet they cost no more than ordinary taps!*

Card Spiral Pointed Taps are available in carbon steel and high speed steel, cut thread, commercial ground or precision ground. See your nearby Card Distributor.

In Card Spiral Pointed Taps the first few threads are milled at an angle to the axis of the tap and with an extreme rake. The superior cutting action of this feature produces a long, curling chip, which is forced ahead of the tap, eliminating chip clogging. This enables the tap to be made with a shallow straight fluting that greatly increases tap strength and reduces breakage to a minimum.

The C.A.R.D. Quality

TAPS

*The Certified* Cutting Tools*

*by the Pittsburgh Testing Laboratory

Also makers of DIES • SCREW PLATES
DIE STOCKS • TAP WRENCHES

**S. W. CARD**

**MANUFACTURING CO.**

Mansfield, Massachusetts

DIVISION OF UNION TWIST DRILL COMPANY

# WINTER BALANCED ACTION

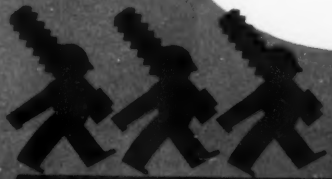
## HAND TAPS

**UNIFORMLY ACCURATE TAPPED HOLES** are easily attained when you specify Winter "Balanced Action" Taps. Among other factors, accuracy of spacing and concentricity of chamfers assure this. Infinite care is taken to see that all cutting edges are truly concentric with the axis of the tap, of the same shape, and of equal spacing. The complete Winter line includes chip driver, hand, machine screw, pipe, nut, tapper, and pulley taps. They are stocked by distributors near you and at factory branches in New York, Detroit, Chicago, and San Francisco. WINTER BROTHERS COMPANY, Division of the National Twist Drill and Tool Co., Rochester, Mich., U. S. A.



**ALWAYS AT YOUR SERVICE**

**YOUR LOCAL DISTRIBUTOR** carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.



WINTER BROTHERS COMPANY

# WINTER

# NATIONAL *SHEARING ACTION* HELEX END MILLS

**SMOOTH, EFFICIENT OPERATION** at high speeds and feeds is yours when you use National "Shearing Action" Helex End Mills. The high helix angle of their cutting edges and their general free cutting action assure better work and long tool life. Helex End Mills are part of National's complete line of rotary metal cutting tools, which also includes twist drills, reamers, milling cutters, counterbores, hobs, and special tools. They are stocked by our distributors near you, and at factory branches in New York, Detroit, Cleveland, and San Francisco.

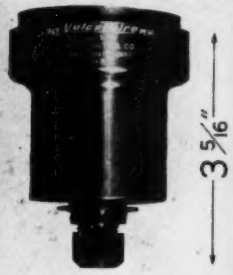
**NATIONAL TWIST DRILL AND TOOL COMPANY,**
Rochester, Michigan, U.S.A.

**"CALL YOUR DISTRIBUTOR"—**

It is NATIONAL'S firm belief, based on long experience, that the local industrial distributor is the one best source for all staple industrial needs—including NATIONAL Metal Cutting Tools.

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH. U.S.A.

*National*




Ball Bearings preloaded with Vulcan special fixtures

# new Vulcanaire spindles

FOR ALL HIGH SPEED, HIGH PRECISION GRINDING — INFINITE SPEEDS CONTROLLED FROM 30,000 TO 65,000 R. P. M.

## NOW IN USE ON

MILLS—ALL TYPES
GRINDERS
WOOD ROUTING MACHINES
GEAR SHAPERS
LATHES
RADIAL DRILLS
PANTOGRAPH MACHINES
SPECIAL MACHINES

**For JIG GRINDING**

*ask for literature on Vulcanaire, Jig Grinder, the new famous 65,000 R.P.M. attachment for jig borers or mills. Be sure to mention machine tool application.*

**SPINDLES**

*For SPINDLE information ask for Vulcanaire Spindle literature and quote. Be sure to mention machine tool application and type of production.*

## USE THEM FOR

* finishing contours on hardened steel working surfaces
* burring or milling die castings
* routing wood contours
* carbide milling or finishing slots
* finishing holes in hardened steel to "tenths"
* grinding with diamond wheels, carbide burrs, or impregnated diamond mandrels.

## ADVANTAGES

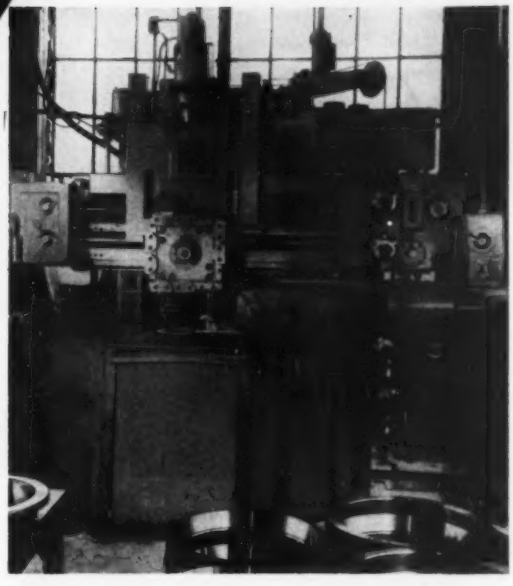
√ 10 micro inch finishes using carbide mills
√ 6 micro inch finishes using mounted points
√ Operates at any angle
√ Air driven—air cooled
√ Speed controlled at optimum point
√ 3 5/16" long motor uses little working space
√ Overheating and expansion prevented
√ Easily adapted

***By controlling speed at ANY point you ELIMINATE need for a variety of types and kinds of constant speed spindles.***

**VULCAN TOOL CO., HIGHLAND AVENUE, DAYTON, OHIO**

AT TYSON BEARING CO.
MASSILLON, OHIO

# 1 Replaces 4



## ONE MAN-AU-TROL V.T.L. REPLACED FOUR FORMER MACHINES — *for the same class of work . . .*

**It handles profitably a variety of comparatively short run jobs.**

**Single cones 10" to 20" in diameter, Double cones, Single cups, Double cups, Closing rings and Large cup and cone spacers are the regular run of work.**

Man-Au-Trol's rugged design provides the rigidity required for the most efficient use of carbide tooling. Here at Tyson they say, "We run the machine at 300 feet per minute on Krupp steel as against the former 60 feet per minute. On Man-Au-Trol we feed at 1/32" per rev. and still hold the work and keep it round. We like the great flexibility of this machine."

From the operator we hear — "The Man-Au-Trol is the best machine in the shop. We use it on any work — delicate or big. It cuts anything it can hold — if it's a rugged piece, she sure gets a good bite. It takes no time to get set, less than on most other machines I've worked on. Adjustments are easy and if the machine is set right, she holds sizes and every piece comes out right. There is no fiddling around for a day or two." *This case study proves that replacement of Economically tired machinery is not only basically sound business but also a means towards Improved Earnings.*

# THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT

# MOTOR STARTERS ...need less

## MARTIN KELLY, PLANT-

Mr. Kelly: *"A big part of my job is to keep every piece of electrical equipment in the plant going—with the minimum of maintenance. That's why I want to know how a motor starter is going to perform a year, even 5 or 10 years from now. I've found that G-E starters need less upkeep than any other starter on the market today. Let me take it apart and show you why."*

Martin Kelly, Plant Electrician for John R. Evans & Co., changes an overload relay on G-E combination starter quickly and easily.

Mr. Kelly: *"First, the coil. It sure takes rough handling!"*

**1** Right you are, Mr. Kelly. We call it the "Strongbox Magnet Coil." That block of plastic keeps the windings permanently protected against dirt, moisture, and oil. And if your screwdriver slips, it can't damage the windings.

Mr. Kelly: *"I've seen no sign at all that these contacts are burning or pitting."*

**2** That's because they have fine silver tips that outlast by far the ordinary type contact. Even where it's a "start-stop" job with dozens of operations each minute, they'll stand the gaff.

GENERAL ELECTRIC

730-20

# upkeep for 4 big reasons!

## ELECTRICIAN, SHOWS WHY—WITH THE "SCREWDRIVER TEST"

Mr. Kelly: *"There doesn't seem to be any wear on the moving parts."*

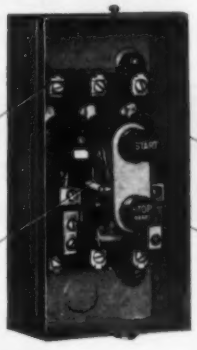
**3** That's right. The moving structure is rugged and basically simple. There's no metal-to-metal friction between magnet and coil; thus, little or no wear. And the "molded-in" lubricant in the coil keeps the magnet operating smoothly and quietly for life.

Mr. Kelly: *"Overload protection means a lot; I certainly don't want any burned-out motors these days."*

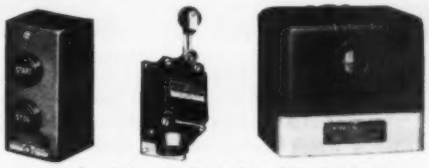
**4** Those overload relays will give your motors all the protection they'll ever need. They are reliable and never need any attention. Heaters are in front and can easily be changed without disturbing any wiring.

## MANUAL STARTERS, TOO . . .

For infrequent starting of 7½ hp or smaller motors, you can't beat a G-E manual starter for economy and dependable operation. . . Built to the same rugged specifications as the magnetic starter, it includes many of the same features for long life and easy upkeep.


Front-connected clamp-type terminals, and plenty of wiring space.
Fine silver contacts long outlast ordinary contacts
Sturdy, vibration-resistant, snap-action switch mechanism
Bimetallic overload protection with heaters readily accessible

A complete line of control accessories . . .

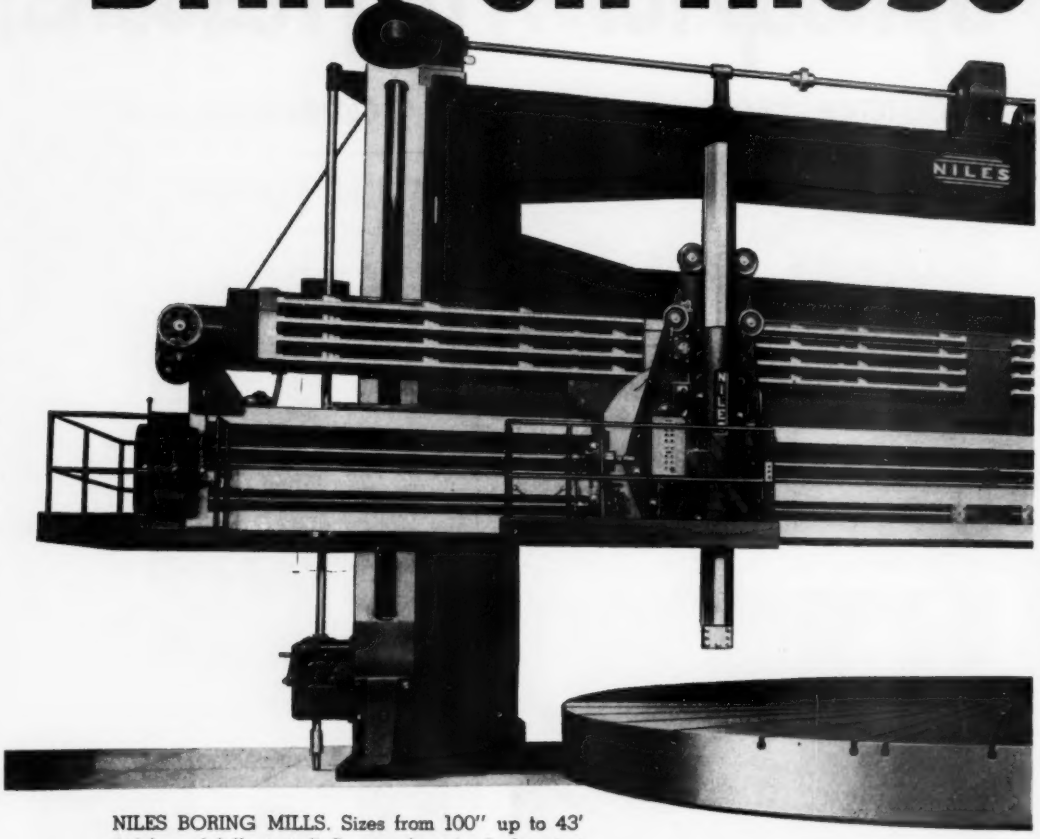


Push-button stations, limit switches, photo electric relays

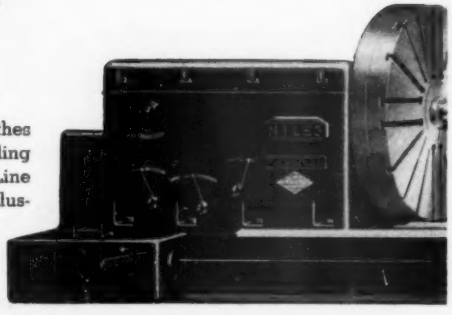
. . . and many others can make operations more automatic, more convenient.

**BUY ONE AND COMPARE!** Disassemble a G-E motor starter, magnetic or manual, and inspect it. See for yourself why G-E starters last longer, cost less to install, and are easier to maintain than any starters you can buy. Your G-E representative or authorized distributor can supply many models of G-E starters in NEMA sizes 0, 1, 2, and 3 for motors up to 50 hp; anticipate your requirements and place your order early. For more information on magnetic starters, write for Bulletin GEA-5153; manual starters, Bulletin GEA-1522. *Section 730-20, Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

# Bring on those




NILES BORING MILLS. Sizes from 100" up to 43' (43-ft. model illustrated). Designed to take the heaviest strains without distortion—maintain close tolerances under high-production operation.



NILES LATHES. These heavy engine lathes reflect over 100 years' experience in building high-output, high-precision equipment. Line includes 40", 50", 60", 70", 80", 90" (illustrated) and larger sizes.

**Write to**
**LIMA-HAMILTON DIVISION**
**Hamilton, Ohio**

**BALDWIN -**

*General Offices: Philadelphia 42, Pa.*

# BIG JOBS

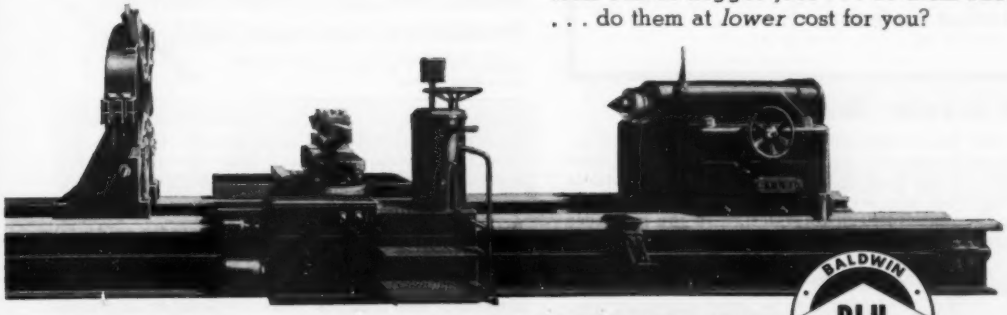
## WE CAN HANDLE THEM *RIGHT!*

Got any *tough* assignments for machine tools? That's what this modern Niles equipment is looking for!

Machine tools like this 43-ft. boring mill and 90" lathe can take care of your *customers'* demands for bigger and bigger jobs . . . and *your* demands for faster and better production, that is the only hedge against today's rising costs.

Under the new Baldwin-Lima-Hamilton name, the line retains everything that has made Niles a guarantee of superior performance—plus advantages that come from increased manufacturing facilities, pooled engineering skills, and expanded service.

Why not write, wire or phone and let one of our representatives demonstrate how Niles tools can do *bigger* jobs . . . do them *faster* . . . do them at *lower* cost for you?

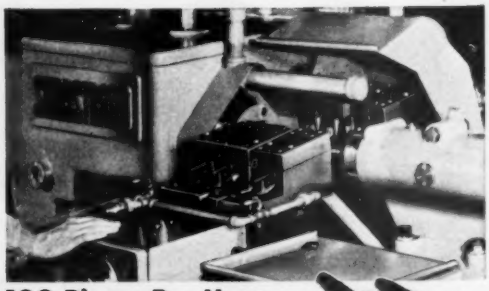


**LIMA-HAMILTON**

BALDWIN · BLH · LIMA-HAMILTON

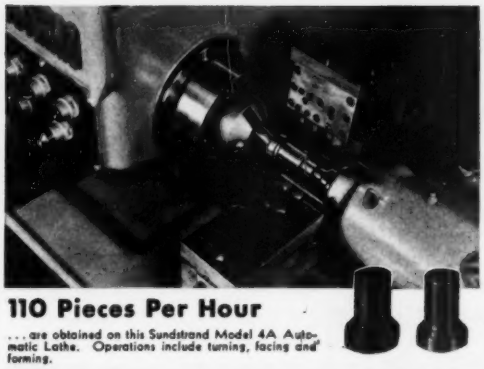
*Offices in Principal Cities*

# INCREASE YOUR PRODUCTION WITH THESE NEW SUNDSTRAND AUTOMATIC LATHES



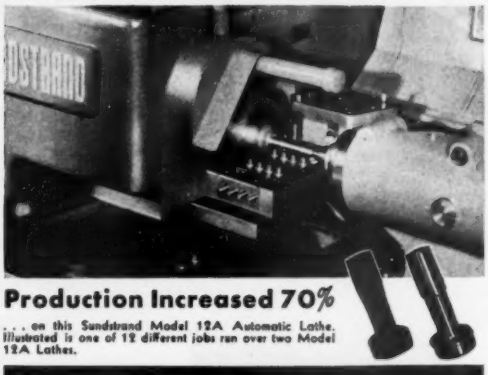
**100 Pieces Per Hour**

. . . is the production rate of this new Sundstrand Model 8A Automatic Lathe. Twenty-two carbide tools are used to groove, face and chamfer transmission part.



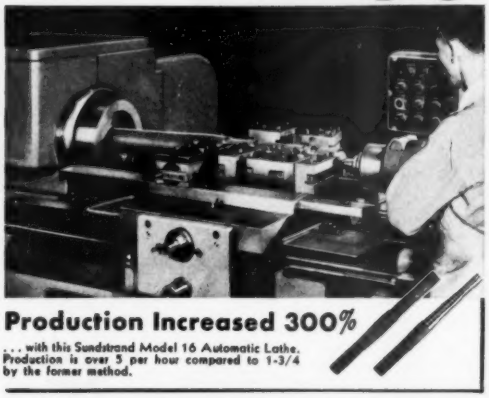
**110 Pieces Per Hour**

. . . are obtained on this Sundstrand Model 4A Automatic Lathe. Operations include turning, facing and forming.



**Production Increased 70%**

. . . on this Sundstrand Model 12A Automatic Lathe. Illustrated is one of 12 different jobs run over two Model 12A Lathes.



**Production Increased 300%**

. . . with this Sundstrand Model 16 Automatic Lathe. Production is over 5 per hour compared to 1-3/4 by the former method.

These are only four of the 8000 or more users of Sundstrand Automatic Lathes. These users have always found Sundstrands a profitable investment and many have changed from old to new Sundstrand Automatic Lathes in order to get even higher productivity as a result of design improvements. The following features incorporated in the design of the latest models of Sundstrand Automatic Lathes will help you increase production.

## *Get Greater Hosrepower*

All new Sundstrand Automatic Lathes have been redesigned for greater rigidity and larger spindle drive motors. They have ample power for use of carbide cutting tools and are capable of doing more work. Note the massive headstock design in the machines illustrated.

## *Get a Wider Feed Range*

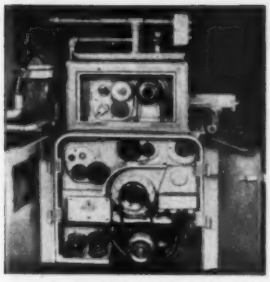
A wider feed range has been provided to enable the handling of a greater range of parts and materials at maximum cutting efficiency. The New Models 4A, 8A, and 12A have a ratio of 18 to 1 between high and low feeds — Model 16 has an even greater range.

## *Get Greater Carriage Adjustment*

Both front and rear carriage of the latest Sundstrand Automatic Lathes are adjustable full length between headstock and tailstock centers — another important new feature.

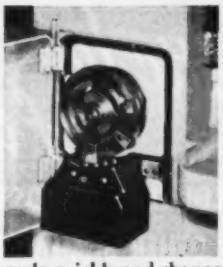
SUNDSTRAND

**RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT**



## Get Faster Set-Up

The photo at the left is an end view of machine showing convenient location of pick-off gears for changing spindle speeds and front and rear carriage feeds. The feed and speed chart and pick-off gear storage compartment are readily accessible for quick set-up or changeover.



## Get Quick Cycle Change-Over

Complete control of all cycles is provided by adjustment of dogs on a disk. Making cams is eliminated. Changing position of dogs on disk changes length of rapid approach, feed and rapid return strokes — enables operator to set up cycle quickly and change over from one job to another easily.

## Get a Wider Speed Range

Spindle speed range ratios have been increased to 30 to 1 on all new Model Sundstrand Automatic Lathes to obtain maximum in cutting efficiency over a wider range of sizes of parts and material. The spindle unit is equipped with two driving gear centers, which increase the range between high and low spindle speeds. In addition, four speed changes can be obtained from one set of gears instead of the usual two.

## Get Automatic DeClutching

All new Sundstrand models have been provided with automatic declutching between spindle and spindle motor with self-adjusting magnetic clutch and brake for quick stopping of spindle rotation.

## Get Screw Feed to Front Carriage

All new Sundstrand Automatic Lathes have screw instead of rack feed to the front carriage — resulting in fine finish and long tool life.

## Get Automatic Lubrication

To insure long machine life and lower maintenance costs, all moving parts within the machine such as spindle bearings, gears, carriage and cross slide ways are provided with automatic lubrication.

## Get Hardened and Ground Steel Carriage Ways

All new Model Sundstrand Automatic Lathes have hardened and ground carriage and cross slide ways.

## 4 Models Cover HP Range of 3 to 75 HP

| | MODEL 4A | MODEL 8A | MODEL 12A | MODEL 16 |
|---|---|---|---|---|
| SPINDLE MOTOR | 3 to 10 HP | 10 to 25 HP | 20 to 50 HP | 50 to 75 HP |
| SPEED RANGE (Type A)<br>(Type B) | 60 to 1800 RPM<br>120 to 3600 RPM | 40 to 1200 RPM<br>80 to 2400 RPM | 30 to 900 RPM<br>60 to 1800 RPM | 15 to 750 RPM |
| FEED RANGE | .003 to .048 IPR. | .004 to .070 IPR | .004 to .070 IPR | .0025 to .100 IPR |
| FRONT CARRIAGE:<br>Longitudinal feed with angular feed-in, max.<br>Swing over cross slide, max.<br>Rapid traverse rate | <br>5"<br>8¾"<br>275" | <br>6"<br>12½"<br>250" | <br>8"<br>15¼"<br>250" | <br>12"<br>17"<br>250" |
| REAR SLIDE:<br>Max. Stroke | 4" | 5½" | 6½" | 8" |
| LENGTH BETWEEN CENTERS | 15, 24 & 36" | 24, 36, 48 & 60". | 24, 36, 48 & 60" | 36, 60 & 84" |

**FREE** ADDITIONAL DATA

The complete new line of Sundstrand Automatic Lathes includes the Models 4A, 8A, 12A and 16 and they range from 3 to 75 HP. Write for complete information on these new machines today. Ask for bulletin 107

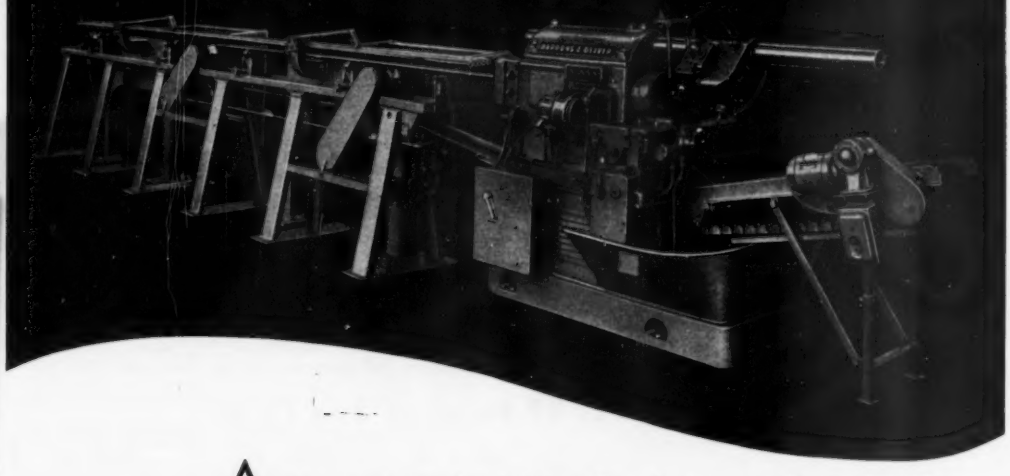
SUNDSTRAND

**SUNDSTRAND**
**Machine Tool Company**
**2533 Eleventh St. Rockford, Ill., U.S.A.**

**DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES**

# *Automatic Loading of the Cutoff Machines*

**GREATLY REDUCES THE COST OF MACHINING COUPLING BLANKS AND MANY OTHER SIMILAR PARTS MADE FROM TUBING AND PIPE**



As shown above, the full lengths of pipe or tubing are fed automatically to the BARDONS & OLIVER NO. 34 HYDRALECTRIC CUTOFF MACHINE. The loading table has capacity for an average size bundle of pipe or tubing.

The chips are removed by the motor driven conveyor.

Reduced labor cost and increased production make the BARDONS & OLIVER NO. 34 HYDRALECTRIC CUTOFF MACHINE WITH AUTOMATIC LOADING TABLE an outstanding investment.

**WE BUILD A FULL LINE OF RAM TYPE TURRET LATHES, AS WELL AS A COMPLETE LINE OF CUTOFF MACHINES**

**BARDONS & OLIVER, INC.**

1133 WEST 9TH STREET • CLEVELAND 13, OHIO

# TIPS ON THE TOPS IN TAPS

**1** They're the complete line, for every tapping application, in every material

**2** They're made in high speed or carbon steel, for best results on every job

**3** 100% inspected...each tap individually inspected

**4** They're Butterfield, of course!

Checking pitch diameters with wires, by the pressure method. Some of the specialized equipment used in Butterfield's 100% inspection.

*Hand Taps • Machine Screw Taps*
*Pipe Taps • Stove Bolt Taps • Pulley Taps*
*Staybolt Taps • Boiler Taps*
*Nut Taps • Serial Taps • Tapper Taps*
*Mud or Washout Taps*

***See Your Nearby Butterfield Distributor For Prompt Deliveries and Service***

Union Twist Drill Company
**BUTTERFIELD DIVISION**
Derby Line, Vermont
*In Canada:* Rock Island, Quebec

# BUTTERFIELD

**THE 100% INSPECTED TOOLS**

*Every Tool Individually Inspected*

TAPS • DIES • REAMERS • SCREW PLATES

## How VERSA-MIL can help you

# ADD MACHINE TOOL FACILITIES

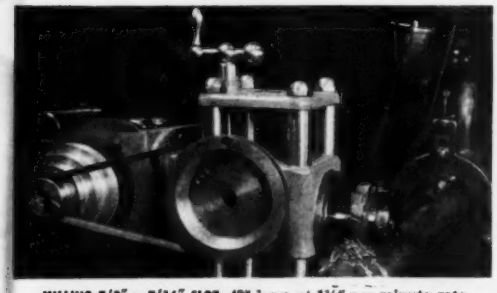
## without waiting for new machine tools

Versa-Mil provides needed, extra tooling right now. You need not wait for new tools to meet today's production needs. Mounted on machine tools, or combined with fixtures, Versa-Mil solves many machining problems.

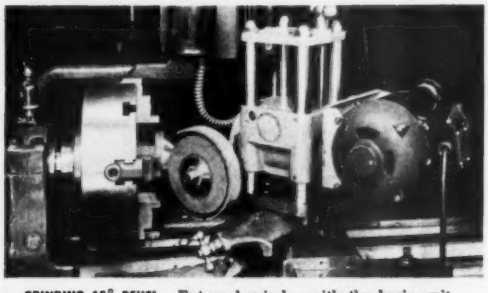
A ruggedly-built direct-powered tool, Versa-Mil is easily positioned with micrometer accuracy, at any angle, right where you need it for the job. It has 26 milling speeds—44 to 5500 rpm; 28 grinding speeds—3000 to 18,000 rpm.

New bulletin shows many jobs where Versa-Mil can save you time and money. Write for your copy. VERSA-MIL COMPANY, 30 Church Street, New York 7, N. Y.

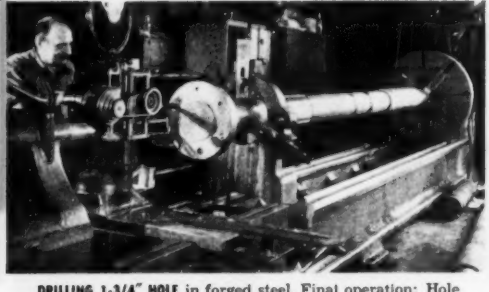
***Look at this PRECISION . . . PRODUCTION . . . PERFORMANCE***



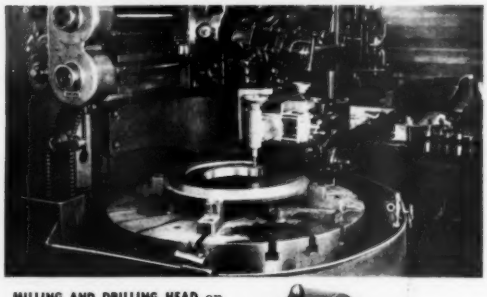
**MILLING 7/8" x 7/16" SLOT,** 42" long, at 1½" per minute rate in mild steel. The 4 hardened and ground posts provide the rigidity for high-rate, chatter-free cuts.



**GRINDING 45° BEVEL.** External grinder with the basic unit has the flexibility of a tool and cutter grinder and the rigidity needed for rapid removal of metal.



**DRILLING 1-3/4" HOLE** in forged steel. Final operation: Hole bored 2" ±.001". Aircraft-type worm and gear transmits power and develops torque required for this job at 1" per minute feed.



**MILLING AND DRILLING HEAD** on the basic unit drilling small radial holes as part of the machining cycle on a large, heavy ring without requiring a second set-up.

The basic unit on the feed table has 3-direction spindle travel: 8½" x 6" x 2".

# VERSA-MIL

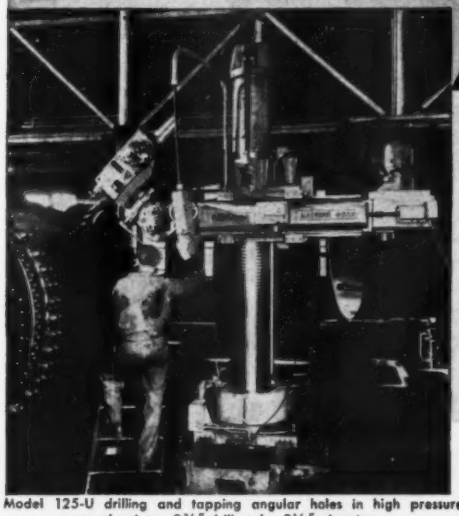
Trade Mark

***The Tool for Precision Milling, Boring and Grinding***

**PRODUCTION-MINDED COMPANIES LIKE THESE** use one or more Versa-Mils in regular production work because it pays: Baldwin Locomotive Works • General Electric Co. • M. W. Kellogg & Co. • Otis Elevator Co. • Fairchild Engine and Airplane Co. • Struthers-Wells Co. • R. Wallace and Sons Mfg. Co. • Wright Aeronautical Corp.

# Kaukauna DRILLING and TAPPING Machines

UNIVERSAL AND HORIZONTAL

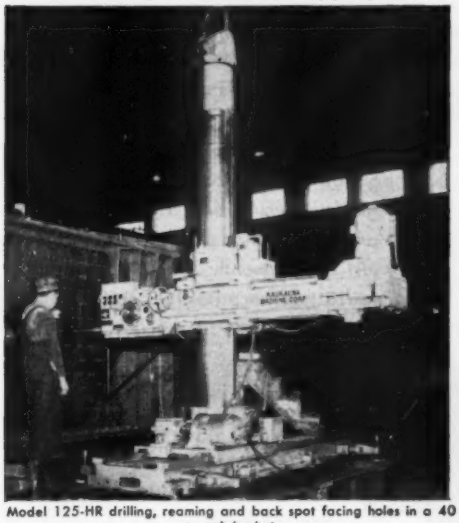


Model 125-U drilling and tapping angular holes in high pressure vessels using a 2¾" drill and a 2½" pipe tap.

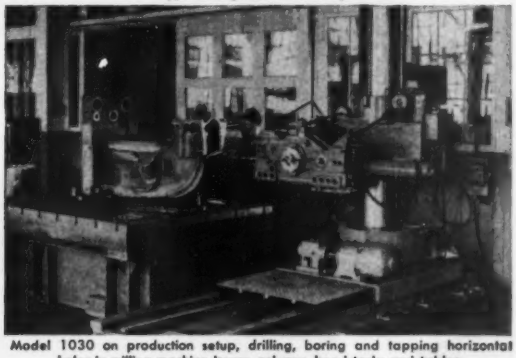
## PROFIT FROM ANGULAR, VERTICAL AND HORIZONTAL OPERATIONS WITH 1 SETUP

**Almost any casting or weldment—of almost any size and shape—can be drilled, tapped or spot-faced in any location accurately, quickly and easily with a KAUKAUNA Machine. Furnished with Universal Head with compound swivels, Tilting Head or Horizontal Head, all with 360° column swivel. Horizontal traverse on runway and vertical traverse on column to suit requirements. For portable or fixed location use.**

Universal Machine drilling, tapping and doweling racks in place on floor type boring machine runways.



Model 125-HR drilling, reaming and back spot facing holes in a 40 cu. yd. bucket.



Model 1030 on production setup, drilling, boring and tapping horizontal holes in milling machine bases, columns, headstocks and tables.

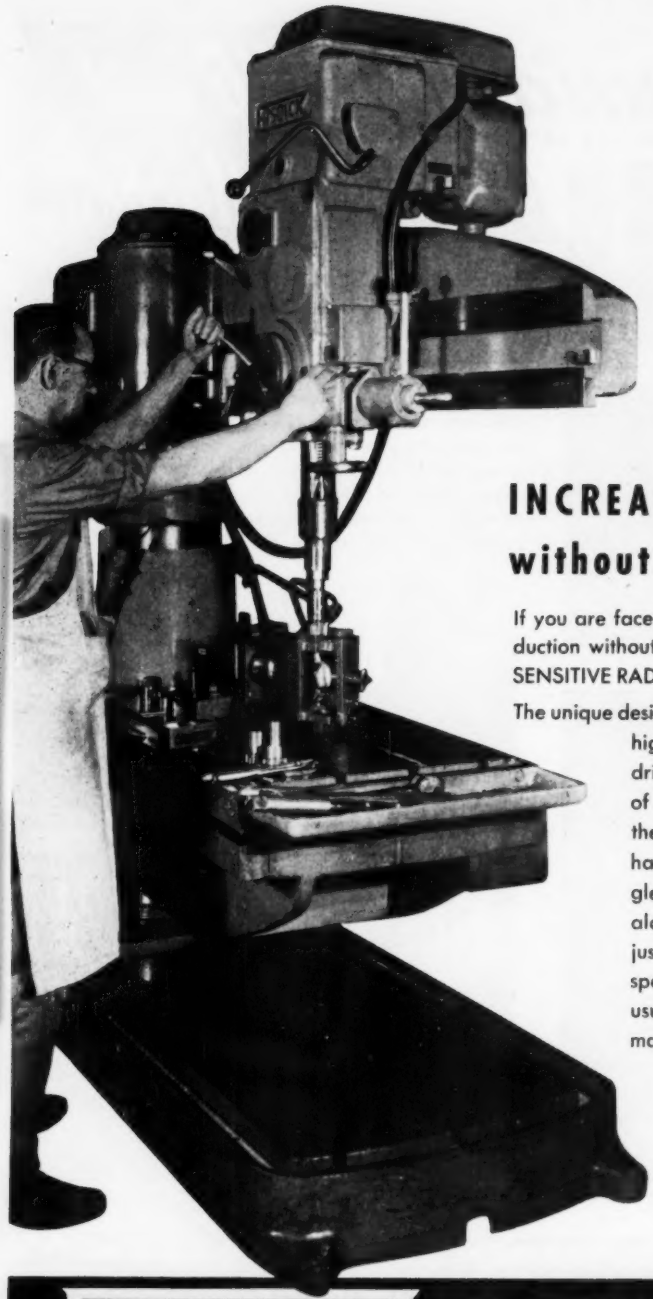
**Cut your costs on setup time, crane time, fixturing and machine hours. *Write for Catalog.***

**Kaukauna MACHINE CORPORATION** KAUKAUNA, WISCONSIN

*General Distributors:* Bryant Machinery & Engineering Company

400 WEST MADISON STREET • CHICAGO 6

*Exclusive Representatives throughout the World*



# *The* FOSDICK *Sensitive* RADIAL

## INCREASES PRODUCTION without increasing space!

If you are faced with the problem of increasing production without increasing space . . . the FOSDICK SENSITIVE RADIAL is the answer.

The unique design of the Sensitive Radial combines the high-speed characteristics of sensitive drilling with the sturdiness and flexibility of a radial. Jobs that ordinarily require the services of two or more machines, are handled quickly and easily on just a single Sensitive Radial. The savings of time alone, more than pays for the machine in just a few months. There's a saving of space too, because the Sensitive Radial usually replaces several less productive machines.

• *Investigate the FOSDICK SENSITIVE RADIAL as a cure for your production ills . . . Write for bulletin SRA today!*

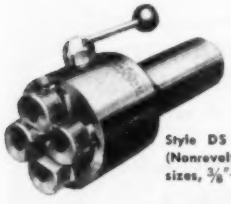
**FOSDICK MACHINE TOOL CO.**
**CINCINNATI 23, OHIO**

# PRECISION by the PILE

**WITH NAMCO GROUND THREAD CIRCULAR CHASER VERS-O-TOOLS**

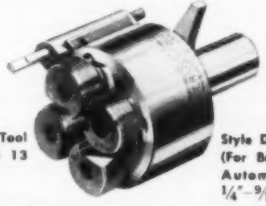
When you use Vers-O-Tools, these workpieces are so typical that we lump them all together and measure them as precision in bulk. More properly, the samples of successful Vers-O-Tool work would be measured in terms of *tons*—for we've licked many a tough production problem: pressure-tight threads, dry-seal threads, API threads . . . and for all uses including aircraft, munitions, tanks, rockets, fine instruments as well as the usual commercial parts.

This is no ordinary success story. The selection of Vers-O-Tools for each of these applications is based on a proved-in-use record of superiority on each of three counts: accuracy and fine finish, longer tool life, increased production. These, in turn, stem directly from the Vers-O-Tool's unique design and construction features. For complete details on how Vers-O-Tools ground-thread-chaser can improve quality and cut costs in your shop, ask for catalog D-51.



Style DS Vers-O-Tool (Nonrevolving Type) 9 sizes, 3/8"–4 7/8".

Style DR Vers-O-Tool (Revolving Type) 13 sizes, 3/16"–4 7/8".



Style DBS Vers-O-Tool (For Brown & Sharpe Automatics) 3 sizes, 1/4"–9/16".

**The NATIONAL ACME CO.**

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

# *Lodge and Shipley* COPYMATIC

# OUTPRODUCES CONVENTIONAL LATHE 3 to 1

**NOTED EASTERN MANUFACTURER Reports!**

**OUTPUT...** *"Increased 200%"*

**VERSATILITY...** *"One of chief reasons it was bought"*

**ACCURACY...** *"Very good"*

**DESIGN FEATURES...** *"Especially like totally-enclosed quick-change gear box"*

"... more pleased than we had hoped," says this COPYMATIC user, noted makers of compressors, engines, pneumatic tools, hoists and pumps. Former production was 5 pieces per hour—with the COPYMATIC, production rose to 15 pieces per hour. By combining three operations and eliminating the human element, production is increased 200%.

This production-rated lathe gives you the added advantage of instant changeover from engine lathe to automatic duplication without the high cost of a special machine.

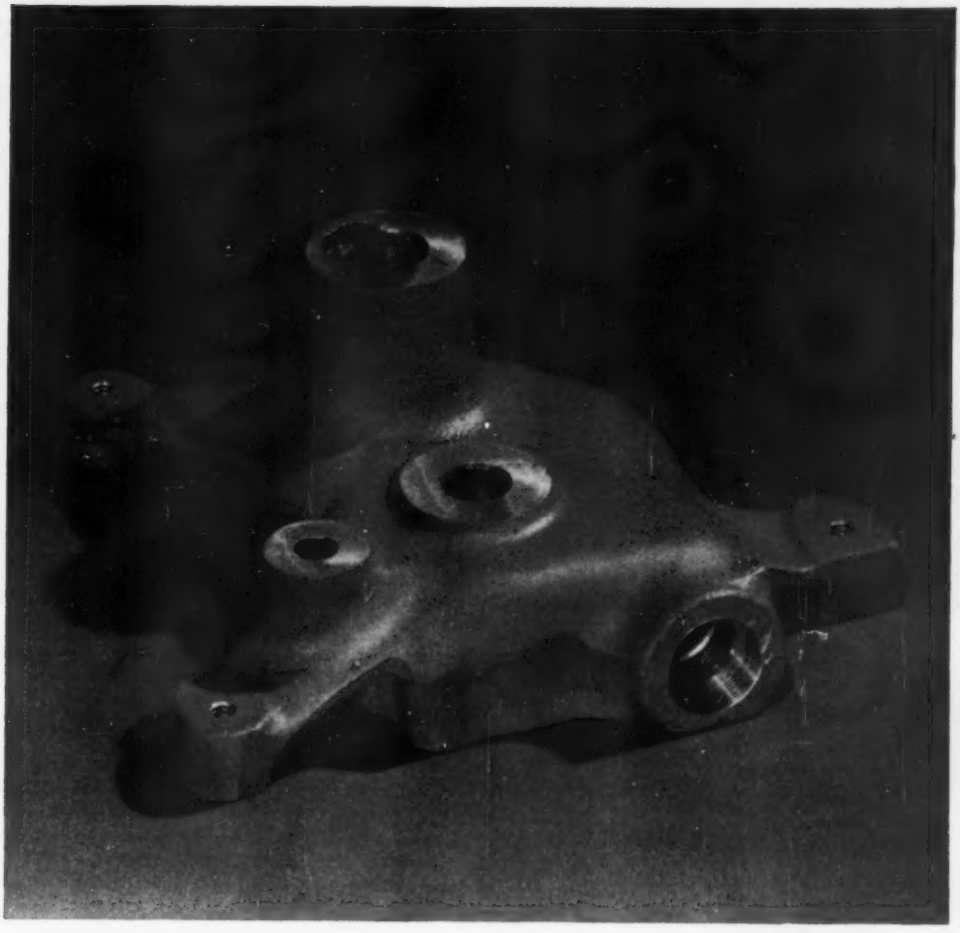
In the illustration, gas engine valves of forged Silchrome XB steel treated to Rockwell C27-32 are being turned at .004" per rev. feed, 270 FPM speed.

The COPYMATIC can give you, too, increased defense production with important savings in time, money, floor space, manpower and less capital investment. Investigate now. Write for Bulletin 675.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3059 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

# The ledger is red with good intentions . . .



**for even the best intentions won't bring back money wasted machining imperfect castings**

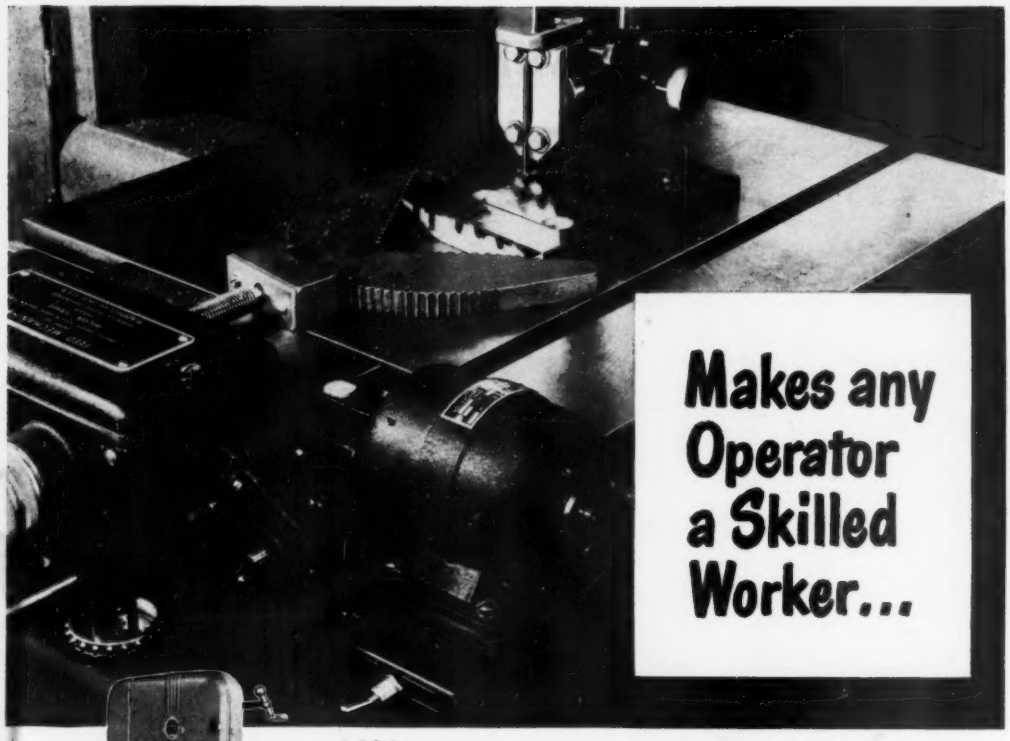
GE X-RAY

That's why so many leaders in industry are placing confidence in radiography. For here's a vital inspection tool, which permits detection of internal discontinuities prior to finishing operations . . . before the ledger grows red with expensive machining.

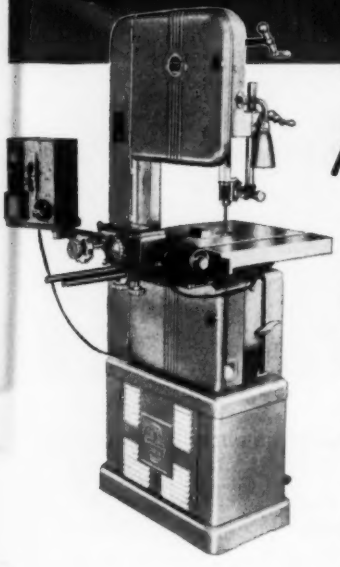
As an inspection device, industrial x-ray is often a non-destructive substitute for physical test and sectioning. But its applications are far broader. In fact, industrial x-ray has become a *development* tool. An instrument that not only diagnoses, but suggests treatment as well. It shows where savings can be made, designs improved, new techniques developed.

Chances are, there's a place for industrial x-ray in your business. Write for booklet "Industrial Applications of the X-Ray." General Electric X-Ray Corporation, Dept. AB-5, Milwaukee 14, Wisconsin.

**GENERAL ELECTRIC X-RAY CORPORATION**



# Makes any Operator a Skilled Worker...



## *New* WALKER-TURNER BAND SAW with *Automatic Feed*

Almost anyone who can throw a switch can do precision-cutting on this band saw. An Automatic Power Feed (one of the most effective methods of cutting metal ever developed) actually leaves little for the operator to do.

Motor driven and automatically controlled by the resistance encountered at the cutting edge, this revolutionary mechanism designed by Walker-Turner maintains a *pre-set* feeding pressure. No more costly blade failure and work stoppage. You *can't* overload a blade with Walker-Turner Power Feed!

Today, with production schedules stepped up and shortages of skilled labor rapidly developing, here's the machine for profitable operations. Cuts sheets, rods, and tubes of steel, iron, aluminum, brass, alloys and compositions, as well as molded plastics.

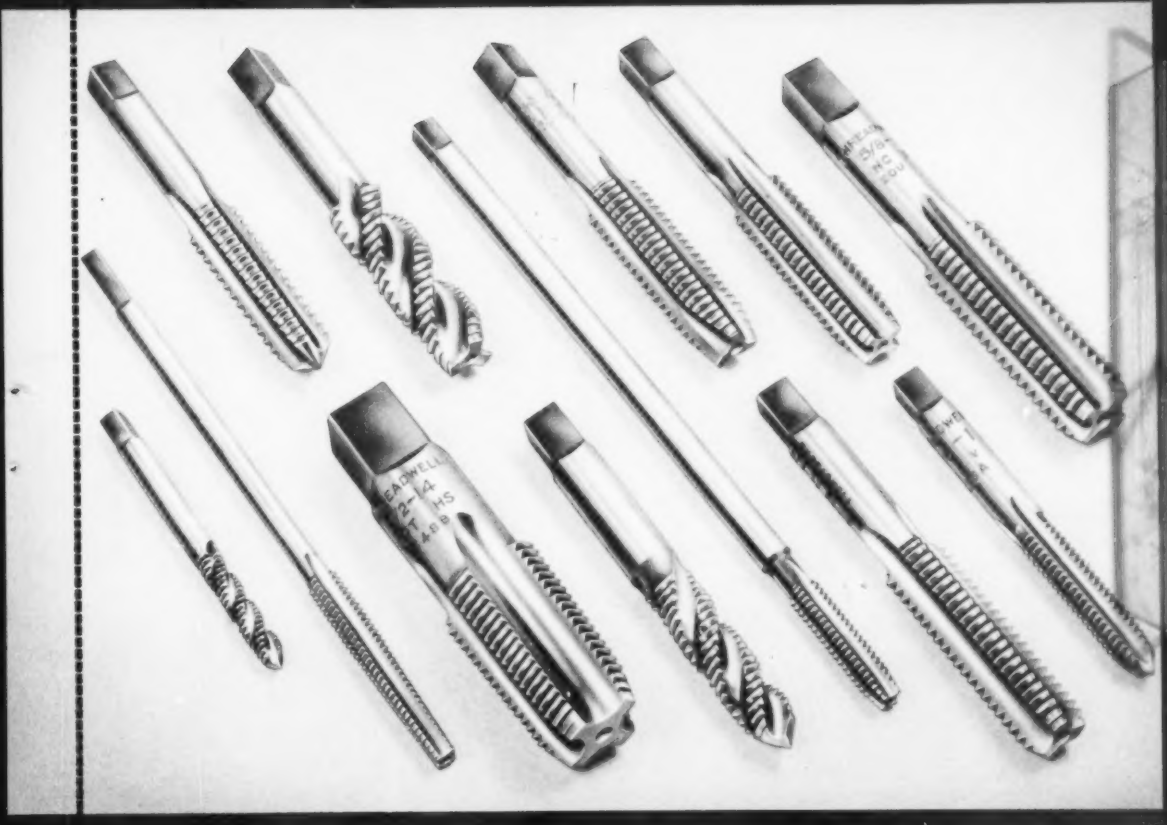
Ask your Walker-Turner distributor to show you the new Band Saw with Automatic Power Feed. Operate it yourself and see how Walker-Turner *design* can help you increase production and lower machining costs. Or write on your company letterhead for full information.

**SOLD ONLY THROUGH AUTHORIZED DEALERS**

WALKER-TURNER
• DIVISION •
KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

DRILL PRESSES • RADIAL DRILLS • TILTING ARBOR SAWS • BELT and DISC SURFACERS
LATHES • METAL-CUTTING BAND SAWS • SPINDLE SHAPERS • JOINTERS

# *Threadwell* TAPS



THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.

# TAPPING SPEEDS & LUBRICANTS for VARIOUS MATERIALS

| MATERIAL | SPEED PER FEET PER MINUTE | | LUBRICANT |
|---|---|---|---|
| | Carbon Taps | High Speed Taps | |
| Allegheny Metal | * | 15 – 25 | Sulphur Base Oil |
| Aluminum | 45 – 50 | 90 – 100 | Kerosene and Lard Oil |
| Bakelite | * | 60 – 70 | Dry |
| Brass | 45 – 50 | 90 – 100 | Soluble Oil or Light Base Oil |
| Bronze | 20 – 30 | 40 – 60 | Soluble Oil or Light Base Oil |
| Bronze—Manganese | * | 30 – 40 | Light Base Oil |
| Copper | 45 – 50 | 90 – 100 | Light Base Oil |
| Die Cast Aluminum | 30 – 35 | 60 – 70 | Kerosene and Lard Oil |
| Die Cast Zinc | 30 – 35 | 60 – 70 | Soluble Oil |
| Duralumin | 45 – 50 | 90 – 100 | Soluble Oil or Kerosene and Lard Oil |
| Fiber | * | 80 – 90 | Dry |
| Iron—Cast | * | 70 – 80 | Dry or Soluble Oil |
| Iron—Malleable | * | 35 – 60 | Soluble Oil or Sulphur Base Oil |
| Monel Metal | * | 20 – 25 | Sulphur Base Oil |
| Nickel Silver | * | 75 – 85 | Sulphur Base Oil |
| Rubber (Hard) | * | 80 – 90 | Dry |
| Steel: Cast | * | 20 – 30 | Sulphur Base Oil |
| Chromium | * | 20 – 30 | Sulphur Base Oil |
| Machinery | 20 – 30 | 40 – 60 | Soluble Oil or Sulphur Base Oil |
| Manganese | * | 10 – 15 | Soluble Oil or Sulphur Base Oil |
| Molybdenum | * | 20 – 30 | Sulphur Base Oil |
| Nickel | * | 25 – 35 | Sulphur Base Oil |
| Stainless | * | 10 – 35 | Sulphur Base Oil |
| Tool | 15 – 25 | 25 – 35 | Sulphur Base Oil |
| Tungsten | * | 20 – 30 | Sulphur Base Oil |
| Vanadium | * | 25 – 35 | Sulphur Base Oil |

* Carbon Taps not recommended.


Threadwell

Threadwell Tools do many jobs

they can do your tough ones

THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.

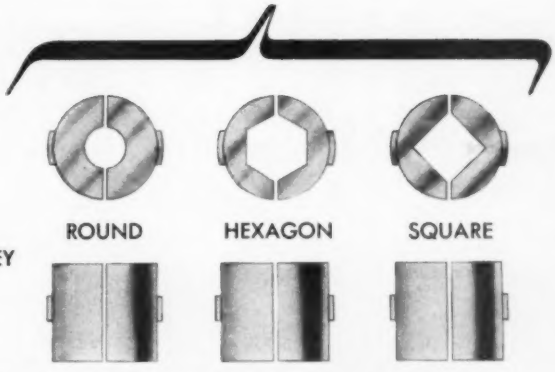
HARDINGE
ELMIRA, N.Y.

# Style "B"

## Master Feed Fingers and Pads

Get better performance and savings with Hardinge Master Feed Fingers and low cost replaceable Pads . . . interchangeable among different makes of automatics with the same capacity . . . available for all sizes of the following machines up to and including 3½" capacity:

BROWN & SHARPE
CLEVELAND
CONE
DAVENPORT
GREENLEE
GRIDLEY AND ACME-GRIDLEY
NATIONAL ACME
NEW BRITAIN




Each pad also furnished in Hardened Steel, Nickel Cast Iron, or Bronze to suit all materials and classes of screw machine work.

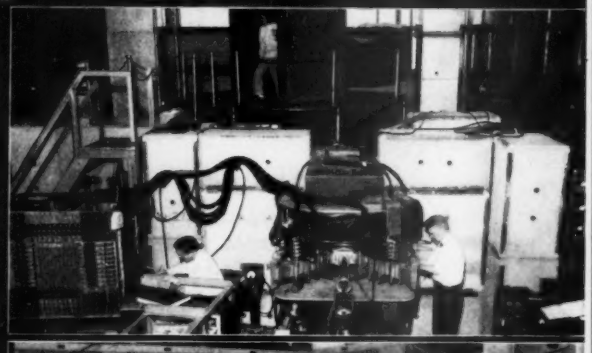
HARDINGE
ELMIRA, N.Y.

**HARDINGE BROTHERS, INC., ELMIRA, N. Y.**

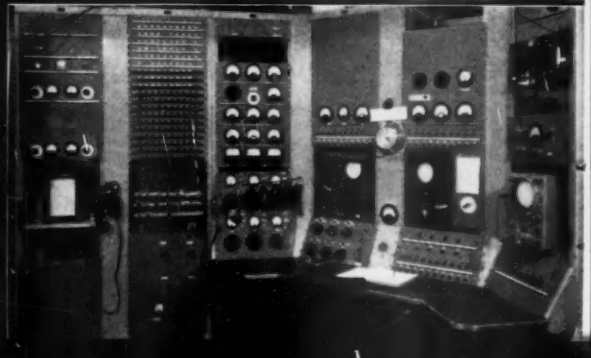
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

# 300,000,000

Precision turning of a special part on the LeBlond Dual Drive Lathe Cornell University, Floyd Newman Laboratory of Nuclear Studies

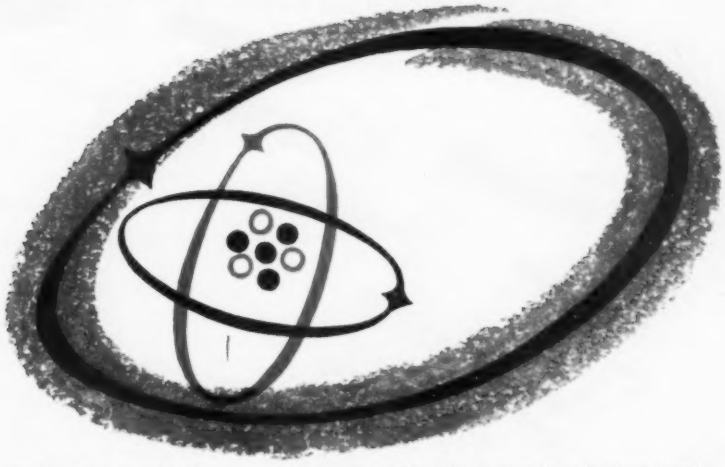


General view of the Cornell Synchrotron Laboratory



Master control panel keeps check on synchrotron

# electron volts work here!



Cornell University's synchrotron accelerates atomic particles to energies of 300,000,000 electron volts. It makes possible the study of atomic nuclei and the forces which hold them together.

The Floyd Newman Laboratory of Nuclear Studies at Cornell needed a versatile, precision lathe to turn the myriad of special parts that go into a synchrotron . . . vacuum pump parts and connections, oscillator tube elements, cloud chamber components, plastic lenses, parts for a special stereoscopic camera, and many more.

They installed a new LeBlond Dual-Drive Lathe, recommended by LeBlond Distributor J. F. Owens Machinery Co. of Syracuse, N. Y. Result? Fast, convenient turning of a great variety of special parts to tolerances as low as .0002".

This new LeBlond Lathe provides hardened and ground steel bed ways; twelve speeds from 28 to 1800 r.p.m., all at full power; 96 feeds from .0004" to .1062"; 48 threads from 4 to 224; 15" swing, 3 h. p. motor. It gives you single-lever speed control; positive-jaw feed control; automatic lubrication to headstock, feed box, apron and ways; totally-enclosed quick-change box; and the American Standard taper spindle nose. You get more for your money in a LeBlond Dual-Drive than in any comparable machine.

Likely you'll never build a synchrotron. But for all the turning jobs you do encounter, there's a LeBlond Lathe to turn them faster, better. Your LeBlond Distributor will tell you about the Dual-Drive and other late models. Call him or write—

**THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO**

*Ask for Bulletin No. 4A*

*for more information on the Dual-Drive*

***turned faster by***

**LEBLOND**
*of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 63 YEARS*

# ARMSTRONG

**Modern Tooling Calls for *the Correct***

## ARMSTRONG TOOL HOLDERS

## for each operation

In the old days it was a matter of pride with toolmakers to be able to do the work at hand with the tools at hand. It's a credit to their skill that they could devise to cut threads, do cutting-off and facing, as well as many other operations with one ARMSTRONG TURNING TOOL, but, at today's labor cost, this would be an expensive practice. The maximum of productive work and true machining efficiency can only be obtained by providing the correct ARMSTRONG TOOL HOLDERS for each operation.

The Armstrong System of Tool Holders provides specially designed ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters, and shapers . . . Turning Tools, Boring Tools, Threading Tools, Knurling Tools, Cutting-Off Tools; tool holders with straight shanks, with off-set shanks, rigid tools and "spring" tools . . . special tool holders for high speed steel bits or blades, for ARMIDE (carbide-tipped) Cutters, for ARMALOY (cast alloy) Bits and Blades.

*These modern efficient ARMSTRONG TOOL HOLDERS are as available as your telephone for they are carried in stock by your local ARMSTRONG Distributor.*

## ARMSTRONG BROS. TOOL CO.

*"THE TOOL HOLDER PEOPLE"*

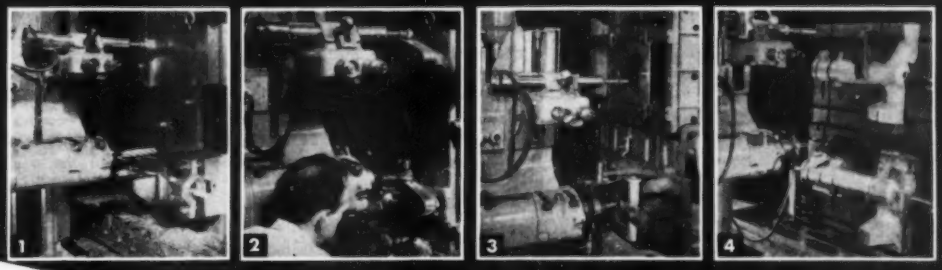
**5215 W. ARMSTRONG AVENUE** **CHICAGO 30, ILL.**

# Operation "KELLERING"
## (AS APPLIED TO AIRCRAFT PRODUCTION)

**KELLERING** is the sure way to keep pace with urgent demands for accurate prototypes in metal — without the need for . . . and expense of . . . preliminary forging dies.

P&W TYPE BL KELLER MACHINE
Two Sizes: 24 x 16 and 36 x 20

The versatility of KELLERING — fast, accurate, automatic, tracer-controlled milling at its economical best — speeds the machining of all kinds of models, molds, patterns, tools and complex parts, either singly, in short run lots, or in quantity production. Defense plants look to KELLERING for profiling *any* material in 2 dimensions . . . or form milling in 3 dimensions . . . from *any* master form . . . to *any* contour. It pays to inquire about KELLERING at your nearby Pratt & Whitney Branch Office.




(1) KELLERING of forged steel aircraft landing gear yokes.

(2) KELLERING complex contours of magnesium aircraft wing fittings.

(3) KELLERING inside contours of forged steel aircraft catapult hooks.

(4) KELLERING steel prototype of aircraft landing gear cylinder.

**PRATT & WHITNEY**
Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

**KELLER MACHINES**
for the economical production of parts for prototypes and pilot models

Shop Set MTT . . . 35 blocks giving 140,000 combinations in ten thousandths. Price in mahogany case, $125.00.

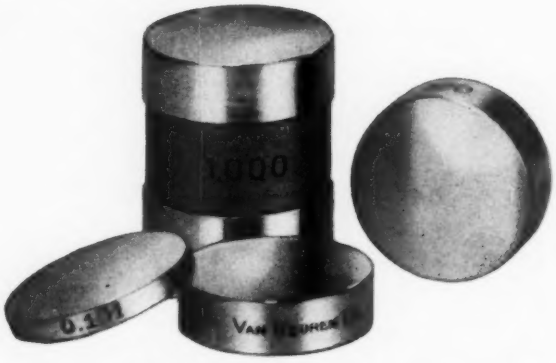
Economy Set MT . . . Over 5000 combinations in thousandths. Price in mahogany case, $50.00.

Micrometer Set M21 . . . Includes 1", 2", 3", 4", 5", and 6" Microgages. Price in mahogany case, $72.00.

Toolmakers Set M64 . . . Gives 121 combinations in 16ths, 32nds and 64ths. Price in mahogany case, $20.00.

# The New Van Keuren

## 7/8 DIAMETER MICROGAGES are the best buy . . . . . .



**60% More Wearing Surface . . . 25% Greater Accuracy . . . No increase in price.**

**A FOUNDATION FOR ACCURACY FOR 25 YEARS**

Van Keuren Microgages have been popular for over 25 years, because they provide a low cost means of securing accuracy in the shop, to meet the demands of the inspection department. The original Microgages were made 11/16" in diameter. The 7/8" body diameter of the NEW Microgages are ground true cylinders, and the end surfaces are held square with the body within close limits. This enables them to be easiily aligned on machine ways for measuring carriage travel. The new Microgages have 40% more wearing surface than rectangular gages and they wring together tenaciously. The 7/8" diameter body provides excellent rigidity for the 6" long blocks.

Microgages up to 1" length are held within a tolerance of plus 12 millionths minus 8 millionths. They have an average wear allowance of 4 millionths oversize. They are available as individual gages from .0625" to 6" length, or in sets especially designed for general shop use, for tool setting and for tool makers and machinists.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

32nd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

# *Your order is in for top performance... when you specify* UNION *twist drills*

**POPULAR TYPES** of Union twist drills. (1) *General Purpose* — For top performance under a wide variety of drilling conditions. (2) *Slow Spiral* — Designed primarily for brass; also recommended for asbestos, bakelite, fibre, hard rubber and plastics. (3) *Fast Spiral* — For drilling deep holes in aluminum, copper, magnesium, marble, slate and other materials of low tensile strength. (4) *Heavy Duty* — For alloy steels, bolt drilling, cast iron, cotter pin drilling, rivets and stainless steels.

**WITH EVERY TYPE OF MATERIAL,** from softest wood to hardest alloy steel — and with every type of drilling equipment, from wood-boring braces to the most complicated machines — you can be sure of best results when you use UNION twist drills. Covering a range of drilling operations, these fast-and-free-cutting drills have maximum resistance to breakage, last longer and do more work between re-sharpenings. Make savings in time, trouble and money a part of your next order for twist drills . . . *Specify UNION!*

**HANDY DRILL SETS**

Union twist drills are available in a complete line of sets, together with metal index containers. Valuable time-savers, these index containers have individually drilled panel holes, with drill sizes, decimal equivalents and tap sizes plainly marked on panels. See your Union distributor for full details.

*no other twist drill will outperform a* UNION

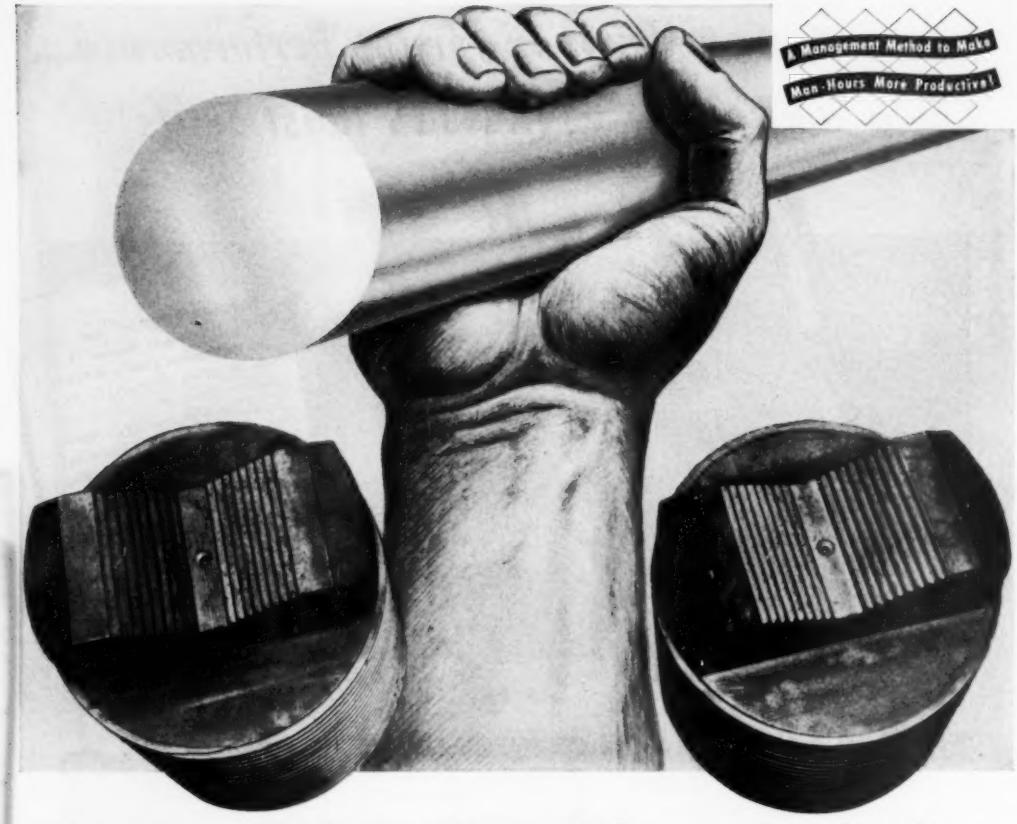
# contact your local distributor

His name is listed in Union's THOMAS' REGISTER insert under "Drills, Twist."

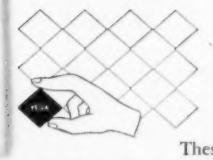
**UNION TWIST DRILL COMPANY,** ATHOL, MASSACHUSETTS

Milling Cutters · Gear Cutters · Twist Drills · Hobs · Reamers · Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass. Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.




# You Can Tighten Your Grip on Production with This Method



These giant jaws, made from Vega (Air-Tough) Tool Steel, grip 13½" round steel billets during rough turning in the largest machine of its type. Steady, uninterrupted production in the operation depended largely on quickly finding the right tool steel.

The company had been using an oil-hardening steel for jaws in normal-sized machines. But when the new giant came along it was a different story. Now a steel was needed that would harden uniformly, and *through very heavy sections*. By using the Carpenter Matched Set Method, the company was right the first time in selecting Vega . . . and saved costly experimenting with different tool steels. More important, production management was able to put the jaws in operation, knowing they could depend upon heavy production schedules being maintained.

This workable Method offers your plant more advantages than accurate, simplified tool steel selection. It can help you make machine operators more productive. It can do a lot to make heat treating a "routine", trouble-free procedure. It can hold your tool steel inventories to a minimum. Find out how, why and where it can work for you. Write for the new booklet "How to Get Better Tool and Die Performance". THE CARPENTER STEEL CO., 109 W. Bern St., Reading, Pa.

Export Department: The Carpenter Steel Co., Reading, Pa.—"CARSTEELCO"

*Carpenter*

**MATCHED TOOL & DIE STEELS**

**More than top-grade steels . . . a Method to keep tooling and production on schedule!**

***For your convenience, Carpenter carries warehouse stocks in principal cities throughout the country***

# Rhapsody in PINK...

There's sweet music in the humming of busy machines. And you'll hear them running faster, smoother than ever—and see metal cutting costs come tumbling down—when you switch to CIMCOOL°. For this revolutionary cutting fluid—this *chemical emulsion*—does a better job while saving you money three important ways:

**Cimcool Increases Tool Life** (and thus reduces down time) because of its *chemical lubricity.*

**Faster Speeds** are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.

**Cimcool Costs Less** than old-fashioned cutting fluids because it lasts longer. It also reduces down-time, cuts labor costs for cleaning and changing. It virtually eliminates rancidity and foul odors. And because of its low surface tension and low adhesion to work and chips, there is practically no carry off.

We sincerely believe that one week's run will convince you. And we'll be glad to provide a demonstration in one of your own machines. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet "CIMCOOL Gives the Answers." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

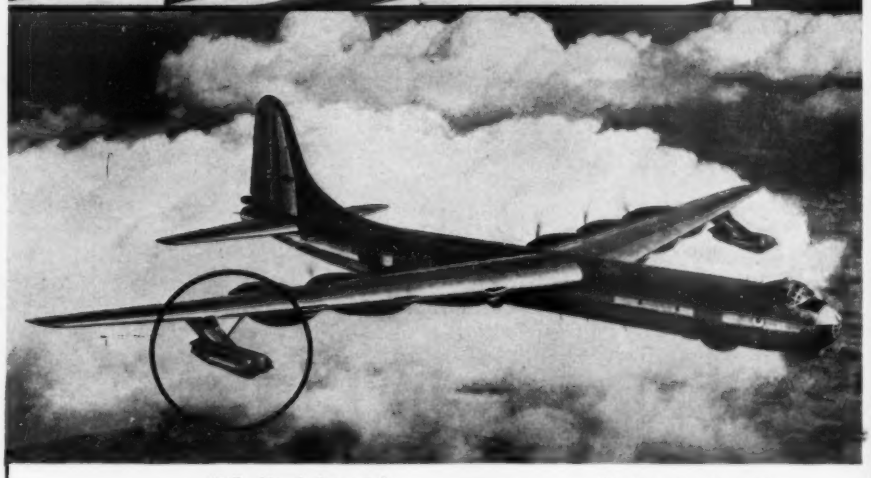
°Trade Mark Reg. U.S. Pat. Off.

*A Production-Proved Product of*
THE CINCINNATI MILLING MACHINE CO.

*for* 85%
OF ALL METAL CUTTING JOBS

**EGGBEATER!** HTL-4 helicopter which Bell makes for the U. S. Navy. Bell uses their 50 ton KRW Hydraulic presses to straighten and re-form rear rotor blades on these 'copters.

**B-36 CONVAIR!** Four auxiliary J-47 jet engines give the B-36 an added boost of speed for take-off, climb to altitude and fast get-away after bombing enemy targets. Bell builds the nacelles for these jet engines and uses KRW Hydraulic Presses to restore proper contour to the aluminum engine saddles after welding and heat treatment.



## QUOTES FROM BELL PRODUCTION MEN

"Bell Aircraft has used KRW Hydraulic presses since the company was founded. Initial cost of the presses was comparatively low, and you can't beat them for low-cost, trouble free operation."

Julius Domonkos, Vice-president in charge of manufacture.

"I've been an arbor pressman all my life. These presses top any I've ever used. They do jobs the bigger equipment can't handle because you can apply full pressure or a slight amount of pressure just as easily."

Gus Schaeffer, Veteran pressman with 40 years experience.

"Our KRW Hydraulic presses can do almost any job you could name, from reshaping the smallest casting to re-forming large engine saddles. Every day I see proof of their flexibility and the delicacy with which varying amounts of pressure can be applied."

Victor J. Moss, Factory Manager.

"We use these presses 100% of the time. They're really reliable trouble-shooters and I don't believe we could do without them."

Charley Schuch, Steel Bench and Welding Shop Foreman.

***Ask your Machinery dealer to quote prices or write or wire Dep't 11***

# K · R ·

# FLYING EGGBEATER OR

# SOUPED-UP SUPER BOMBER

Vice President in charge of Manufacture, Julius J. Domonkos, (left) and Factory manager Victor J. Moss watch Gus Schaefer, veteran Arbor pressman restore proper contour to B-36 Jet engine saddle with KRW Hydraulic press.

## Bell Keeps Both in Fighting Trim with KRW HYDRAULIC PRESSES

"Go right ahead," said Bell Aircraft officials when we asked permission to write an ad around the KRW equipment in use at Bell. There's only one reason for this splendid cooperation: Bell feels that their KRW presses merit recommendation to other manufacturers.

At present Bell Aircraft has three KRW 37E 50 ton Hydraulic presses with more on order. They are used for bending, straightening, forming and re-shaping essential parts for aircraft and helicopters. And Bell tells us they're trouble-free, cost-cutting pieces of equipment that they couldn't do without.

Any use for hydraulic presses in your operations? Check with K. R. Wilson before you buy. KRW has a full line of standard presses ranging from 25 - 150 ton capacities. Either hand operated, air operated or motor driven; one, two and three cylinder models. And the beauty of KRW presses is that they're all self-contained above ground. No expensive foundations needed. Fast and flexible, KRW hydraulic presses can be converted from one job to another almost overnight. And they'll do jobs ordinarily reserved for heavier, more expensive mechanical equipment. If you need a specially designed press, our engineers will tailor-make one to your needs.

# WILSON

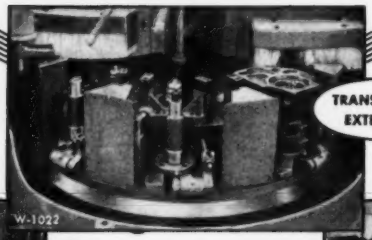
215 MAIN STREET BUFFALO 3, N. Y.

# Put them on a Blanchard

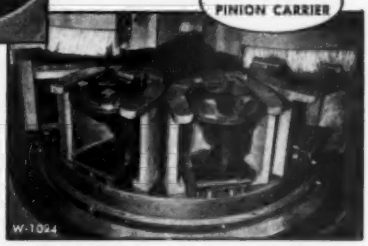
## NO. 16-A2 AUTOMATIC

This two-spindle surface grinder is a real producer. In a single pass, the work is roughed by one wheel and then finished by the second wheel. Because each wheel can be selected for its part of the grinding operation, without having to compromise between roughing and finishing, the No. 16-A2 is particularly suited to work requiring high production. Close limits are assured by automatic size control for each wheel. If you're looking for maximum results with minimum effort, get production details on just how fast your own work can be done on the No. 16-A2.

Send blueprints or samples — there is no charge or obligation.



The joint face is ground by loading the cast iron part over a post, locating from a shoulder, supporting the flange by a spring bunter. It is clamped automatically. Parts are held flat to .001", square with bore to .002", and to ±.001" for size. 84 pieces ground per hour on one side.




These cast iron caps are placed in suitable stations, automatically clamped, ground, and automatically unclamped. 1020 caps per hour are ground to ±.003", and flat to .002" in a 20 station fixture. 1/16" of stock is removed per side.

Send for your free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

These cast iron parts are loaded with the flange under a "U" shaped block, clamped upward against the block. The four bearing surface "feet" are ground to limits of ±.003", parallel to flange within .001". 229 pieces are ground per hour on one side.

PUT IT ON THE BLANCHARD

**THE BLANCHARD MACHINE COMPANY** 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

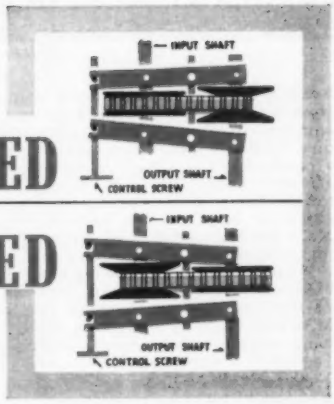
*Only*

**with the P.I.V. variable speed drive can you go**

# from MAXIMUM SPEED

# to MINIMUM SPEED

**in an infinite number of positive settings!**




Here's the only variable speed drive on the market today that's not dependent on friction. Link-Belt's P.I.V. gives you exact speed selection in *positive*, infinitely variable settings . . . transmits full rated horsepower throughout its complete range.

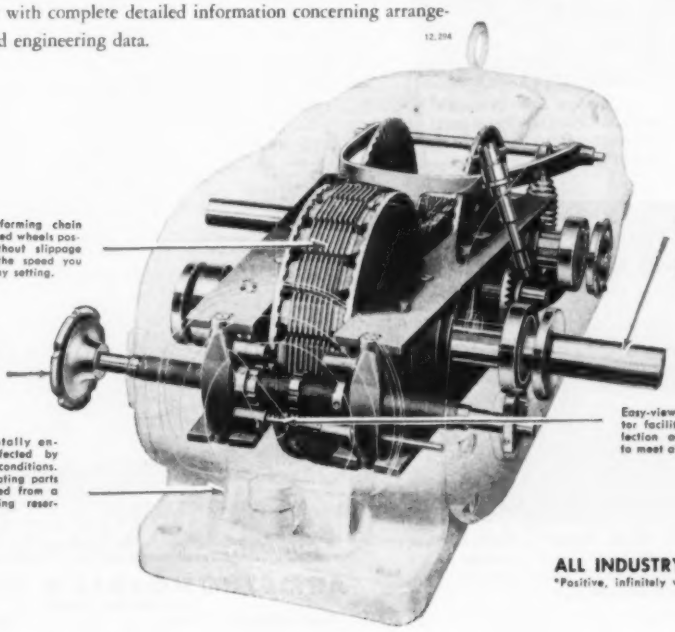
Find out how Link-Belt's P.I.V. can increase the flexibility and efficiency of your machines. Call the branch office near you. Pre-selection of the right P.I.V. variable speed transmission for your needs can be readily obtained together with complete detailed information concerning arrangements, ratings and engineering data.

12.204

LINK-BELT

P.I.V. VARIABLE SPEED DRIVE

**LINK-BELT COMPANY:** Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in Principal Cities.



Self-tooth-forming chain grips toothed wheels positively without slippage — gives the speed you need at any setting.

You can get minute speed changes and maintain them accurately while operating under full load.

An infinite number of positive, stepless speed adjustments may be made with manual, electric, pneumatic or hydraulic controls.

Easy-view speed indicator facilitates speed selection and adjustments to meet all requirements.

All-metal, totally enclosed — unaffected by atmospheric conditions. All vital operating parts splash-lubricated from a common housing reservoir.

**ALL INDUSTRY USES P.I.V.***

*Positive, infinitely variable

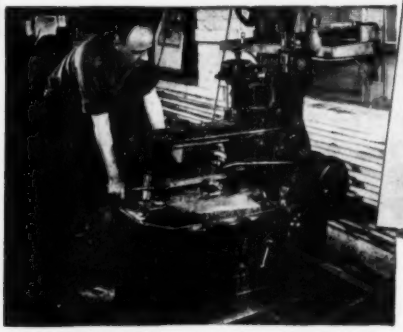
# WHICH IS BETTER FOR YOU, HACK SAWS OR BAND SAWS

**Reading Chain & Block Corporation found the answer by contacting the MARVEL field engineer. Only a MARVEL engineer could analyze this problem without bias because only MARVEL makes both hack saws and band saws. As a result, Reading bought three different types to most efficiently handle their metal sawing. A No. 6A machine for production cutting of identical pieces, a No. 4B machine for fast, accurate, miscellaneous cutting, and a No. 8 band saw machine for cutting of structurals, mitering, and other miscellaneous work.**

**Whatever your metal sawing problem, there is among MARVEL'S 11 different series of sawing machines, a saw or saws that will exactly meet your needs. Your local MARVEL Engineer will gladly study your sawing problems, make recommendations and quote prices.**

No. 8 MARVEL Metal Cutting Band Saw. This most versatile saw takes work up to 18" x 18", mortises, miters or roughs to shape.

No. 9A MARVEL Production Saw (world's fastest) automatically feeds, measures and cuts off identical pieces from nested or single bars up to 10" x 10" cross section.



No. 4B MARVEL Hign Speed Saw is a moderate priced, very fast 6" x 6" capacity saw. Here it ideally meets the requirements of the maintenance department.

READING CHAIN and BLOCK CORPORATION

Manufacturers of Materials Handling Equipment

CHAIN HOISTS · ELECTRIC HOISTS · TRAVELING CRANES · MONORAIL SYSTEMS

READING, PA., U.S.A.

October 24, 1947

Armstrong-Blum Mfg.Company
5700 West Bloomingdale Avenue
Chicago, 39, Illinois

Gentlemen:

We have in our shop three Marvel Saws which are used all day in production work for the cutting of materials in connection with the manufacture of hoists and cranes. Since these three saws have been used in our plant the cost of cutting materials has been greatly reduced, and the speed at which the materials are cut has been increased to such a point that we no longer have "lay overs" due to the lack of materials.

We wish to assure you at this time that when we need more automatic saws in our plant, we will definitely give you first consideration to install the Marvel saws in our plant.

Whenever it has been necessary for any repair service, or engineering service, to be applied to these saws, we have never had to wait or inquire the second time for these services. That is one thing that has kept us in production to this date.

Again assuring you that your services and attentions to our requirements have been very satisfactory, we remain,

Very truly yours,

READING CHAIN & BLOCK CORP.

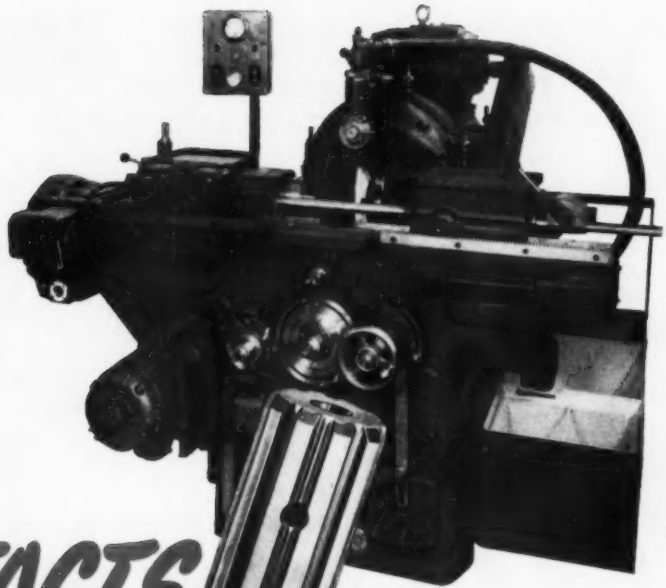
Fred M. Howard

Fred M. Howard
Purchasing Agent

FMHrakh

MARVEL SAWS
Better Machines—Better Blades

**ARMSTRONG-BLUM MFG. CO.**
*"The Hack Saw People"*
**5700 Bloomingdale Ave. Chicago 39, U. S. A**



6" x 15" Jones & Lamson Automatic Thread Grinder.

# FACTS on improving production!

The New Process Gear Corporation, Syracuse, N.Y., installed a Jones & Lamson Automatic Thread Grinder to grind Class IV threads on main drive pinions. The threads are ground from the solid, after the piece has been completely machined (including the keyway in the thread diameter) and hardened.

This is how their investment paid off:

PRODUCTION: 80 CLASS IV THREADS PER HOUR
SCRAP REDUCED 50%
SUBSTANTIAL SAVINGS IN DIRECT LABOR COSTS, OVERHEAD AND GAGE COST.

In addition to better quality threads and more uniform finish J&L Automatic Thread Grinders:

- reduce handling costs
- eliminate costly rethreading after heat treatment
- eliminate expensive retooling when specifications change
- reduce the cost of gage maintenance

Now, more than ever, the most efficient machines and methods are needed to make the most of your available manpower and material. Jones & Lamson is ready, willing and able to help you get maximum results from your turning, threading and inspection operations. Write *today* to Department 710.

***Turret Lathes—Fay Automatic Lathes—Thread Grinders—Optical Comparators—Threading Dies***

**JONES & LAMSON**
MACHINE COMPANY
Springfield, Vermont, U.S.A.

***Machine Tool Craftsmen Since 1835***

**TUMICO HAS EVERYTHING IN PRECISION INSTRUMENTS FOR**

# *Quality Control*

If it's big outside, say up to 168", measure it accurately with a giant 14 foot Tumico Bar Micrometer.

If it's small inside, say down to 200 thousandths diameter, Tumico has the inside micrometer to measure it accurately.

And in between Tumico has calipers, gages, micrometers and every other precision instrument needed for fast, accurate measuring.

*See your dealer, or write us direct for literature.*

**TUBULAR MICROMETER COMPANY**
St. James, Minnesota • U.S.A.

FEATHER TOUCH
**TUMICO**

SEATTLE • LOS ANGELES • DENVER • DALLAS • CHICAGO • DETROIT
MINNEAPOLIS • KANSAS CITY • ATLANTA • NEW YORK • TORONTO, CANADA
EXPORT OFFICE: CHICAGO

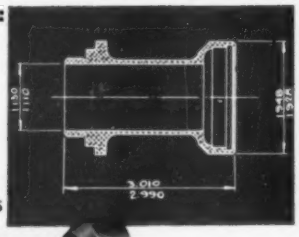
# BOTH Jobs machined on the new DIALMATIC CLEVELAND

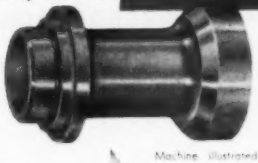
**BAR JOB DATA:**

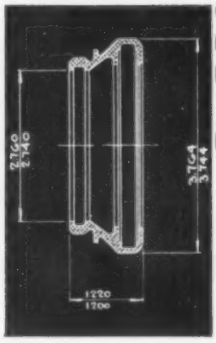
**PART:** Housing

**MATERIAL:**
Aluminum Bar Stock

**PRODUCTION:**
75 Pieces/Hour Gross






**CHUCKING JOB DATA:**

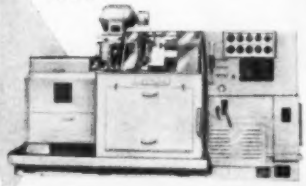
**PART:** Coupling

**MATERIAL:**
Aluminum Forging

**PRODUCTION:**
53 Pieces/Hour Gross

Machine illustrated above built for Marcus Mason and Company, Inc., designers of the parts illustrated.

**Cleveland Dialmatic 2½" Model AB Single Spindle Automatic. For machine design, construction and specification details, write for descriptive bulletin.**



The most versatile single spindle automatic screw machine in the field! The Model AB Dialmatic Cleveland is *easily* and *quickly* convertible from a bar machine to a chucking automatic by substituting a simple, low-cost chucking attachment for the stock feed group in the spindle.

If you are producing steel, brass or aluminum parts up to 2½" diam. from bar stock—and doing an occasional chucking job on pieces up to 6" diam.—find out now how much you can lower your production costs with the new Dialmatic Cleveland. Cleveland engineers will be pleased to submit a direct proposal with production estimates on your work.

**Remember,** *Clevelands Cut Costs*

**THE CLEVELAND AUTOMATIC MACHINE COMPANY**

**4928 Beech Street**
**Cincinnati 12, Ohio**

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • NEWARK

**Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines**

STANDARD Gages

# ALL THESE... and MANY MORE

*For doing your job better . . . easier!*

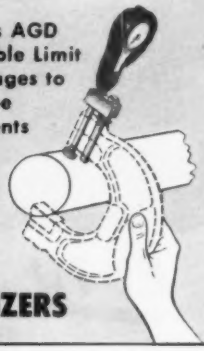
7 Sizes
Cover Range
3/8"-12 1/8"

**DIAL BORE GAGES**

Various Sizes and Graduations

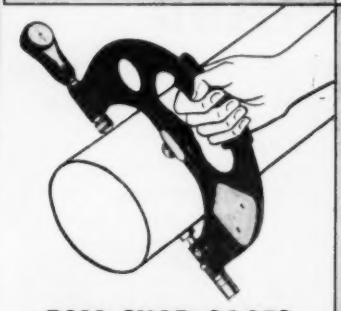
Shockproof

**DIAL INDICATORS**



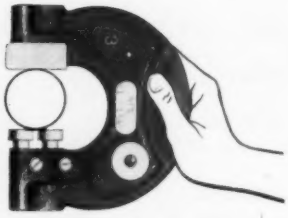
Converts AGD Adjustable Limit Snap Gages to Dial Type Instruments

**DIALIZERS**



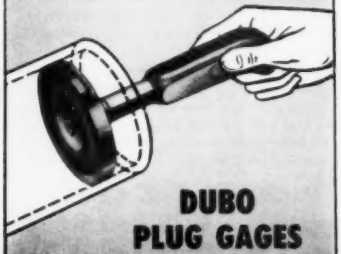
**DIAL SNAP GAGES**

**DIAL COMPARATORS**

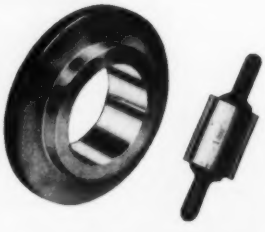


**ADJUSTABLE LIMIT SNAP GAGES**

Light in Weight
Sensitive, Definite Check



**DUBO PLUG GAGES**



**MASTER SETTING GAGES**

*Write for New Catalog B*

**STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.**

# Often it takes all three...

A typical example of the many products which call for the use of not one...two...but *all three* types of abrasives in the manufacturing process are shears. Thus at three different stages it is important to be able to count on the performance of a coated abrasive, a bonded abrasive, or abrasive grain in obtaining best results.

You'll find it pays to standardize on Abrasives by CARBORUNDUM for these varied grinding, sanding or finishing operations. Only CARBORUNDUM manufactures a *complete* line of abrasive products from which you gain the advantage of uniform high quality...and an impartial recommendation of the *right* abrasive for each operation. See your CARBORUNDUM representative, or write Dept. AM 80-22.

## *Only* CARBORUNDUM

TRADE MARK

***makes ALL Abrasive Products...to give you the proper ONE***

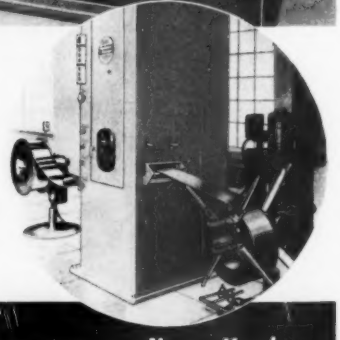
*"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N.Y.*

# M-R-C

## Synthe-Seal Ball Bearings

*CURTIS STRAIGHT-O-MATIC in a leading New England Steel Mill*

**50 M-R-C Synthe-Seal Ball Bearings**
used in the CURTIS 600AA STRAIGHT-O-MATIC
METAL STRIP GRINDER & POLISHER ***(either wet or dry operation),*** equipped with synthetic rubber seals — provide positive protection against grit and moisture, assuring smooth trouble-free operation and low maintenance cost.

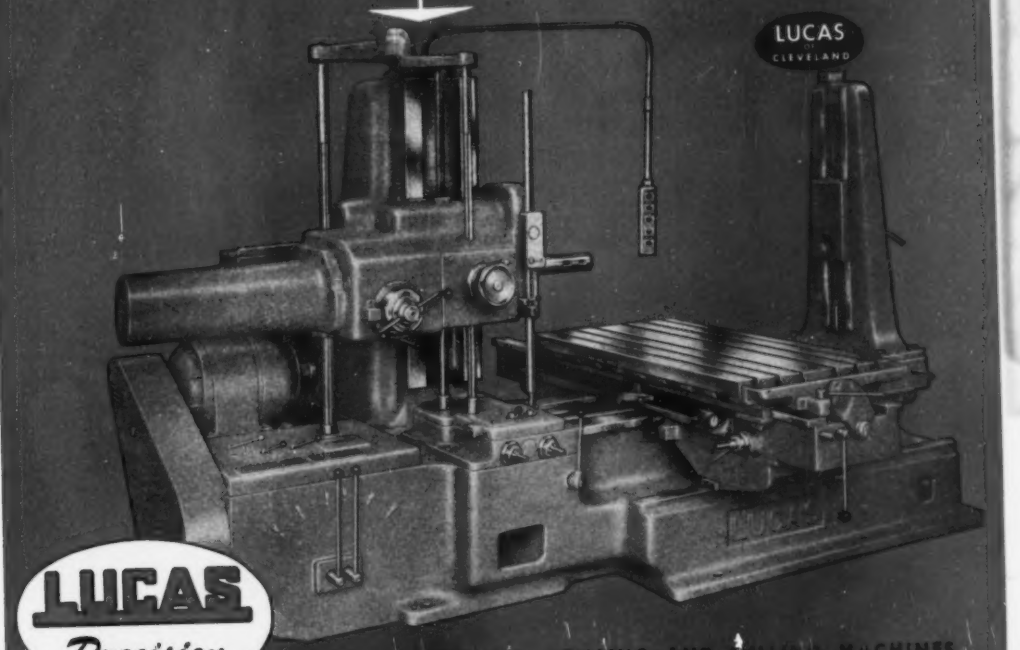


**MARLIN-ROCKWELL CORPORATION,** Jamestown, New York

# These *Big improvements* in boring machines have been Lucas Features *for years*

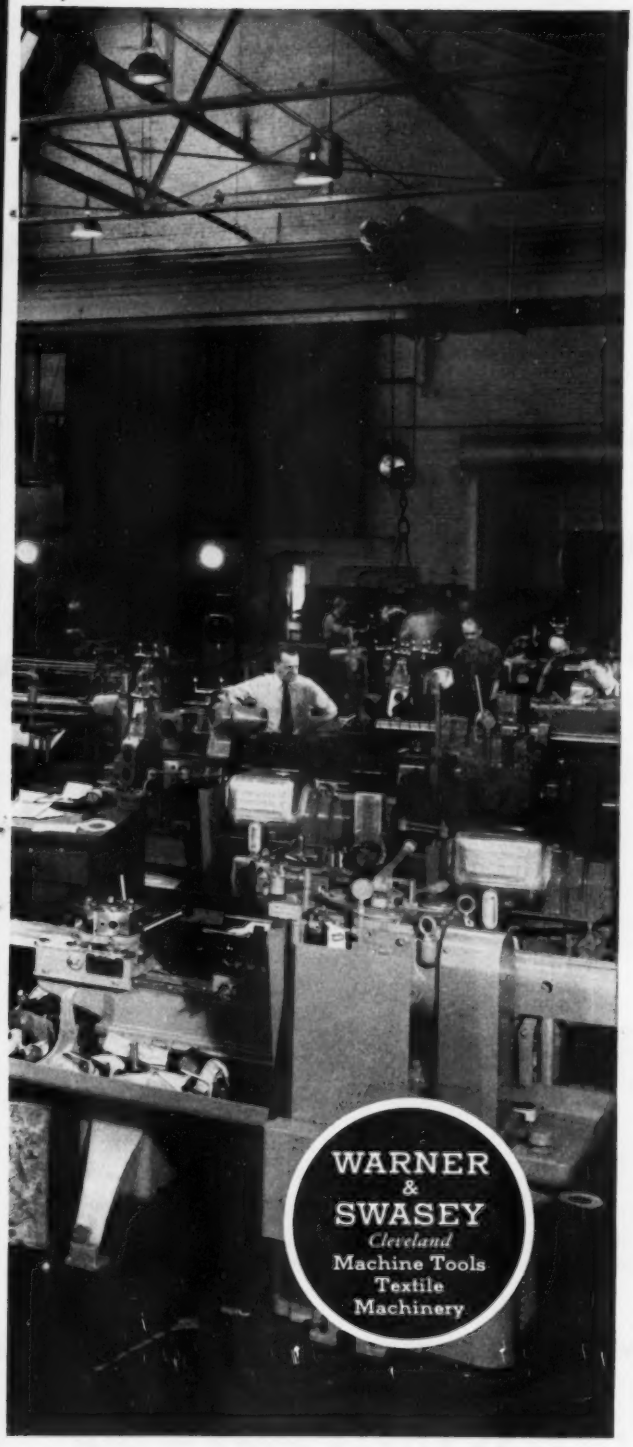
Every advancement of importance to be found in *any* boring mill is obtainable in a Lucas. In many cases Lucas has been years ahead, and some very important developments can be found *only* in Lucas machines. Fifty-one years of specialization on one product has made Lucas the first name in its field.

- Automatic power positioning
- Integrally cast four way beds with 4 point support
- Complete range of feeds and speeds to one spindle
- Pendant control
- Vibrationless V-Belt drive to spindle at high speeds
- Complete line of attachments
- Hardened ways
- Chrome plated lead screw




LUCAS *Precision*

HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO




# Our severest critics are right in our own plant!

Contrasting with the constant pressure for production in other departments at Warner & Swasey is the calm, methodical work of one group of our men. These men are our severest critics—our final inspectors.

By the time an assembled turret lathe reaches one of these final inspectors, its individual parts have already passed 15,000 inspections!

*But that is not enough!* The final inspector carefully rechecks the completed machine—*proves* beyond doubt that it is ready to turn out the high precision work for which it is designed. Only then does he *sign his name* to a written report certifying that the turret lathe he passes is as perfect as human skill can make it.

Like our other departments, "final inspection" is working day and night to get machine tools to our shipping platform on schedule. But despite stepped-up production and urgent delivery dates, *no* machine leaves our plant until it meets the long-established Warner & Swasey standards for accuracy and dependability.

**YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES**

# FROM LAMINATIONS TO REFRIGERATOR DOORS... BLISS HAS THE RIGHT PRESS FOR THE JOB

**A picture tour of Bliss Presses in action at various General Electric Company plants**

Whether your metal-stamping production is large or small, requiring automatic or hand-fed presses...mechanical and hydraulic...Bliss has the right press for your job.

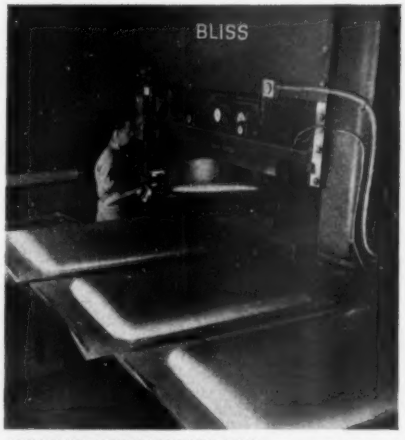
Illustrated here are but a few examples of specially engineered Bliss equipment at work in various General Electric Company plants. Thousands of others are producing profits for leading manufacturers the world over.

For blanking, forming, drawing or squeezing operations, Bliss engineers are equipped to make unbiased analyses and recommendations for proper methods and equipment. Bliss is the only company that builds the complete range of press equipment required by industry.

Next time you need advice on metal-stamping production, call your Bliss representative. Show him your high-cost stampings. Selecting proper equipment and methods is "everyday" business with Bliss engineers, who are skilled in pressed-metal techniques and equipment. There's a good chance that they can give you the right answer.

**E. W. BLISS COMPANY, CANTON, OHIO**

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

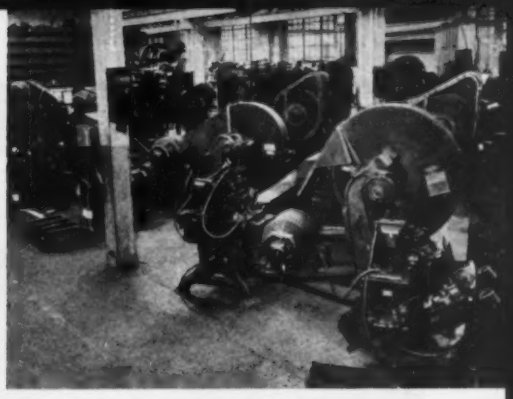



**AT ERIE, PENNSYLVANIA:** Doors for home refrigerators are drawn in this 350-ton Bliss "E" type straight side press equipped with Bliss-Marquette die cushions.

BLISS BUILT

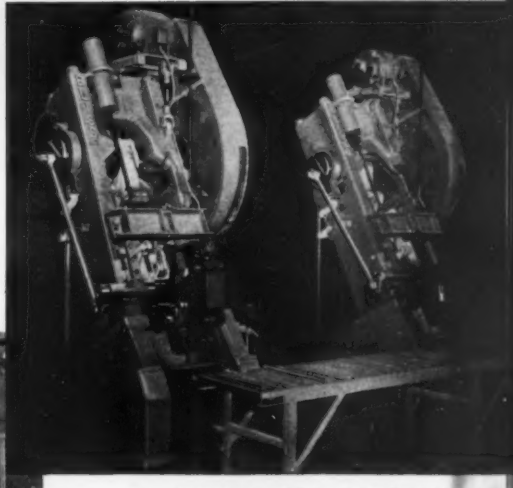
**FROM THE RIGHT PRESS FOR A GIVEN JOB...**

**AT TIFFIN, OHIO:** Hermetic refrigerator motor laminations are repunched at high speeds in two lines of Bliss Special No. 304½ presses.

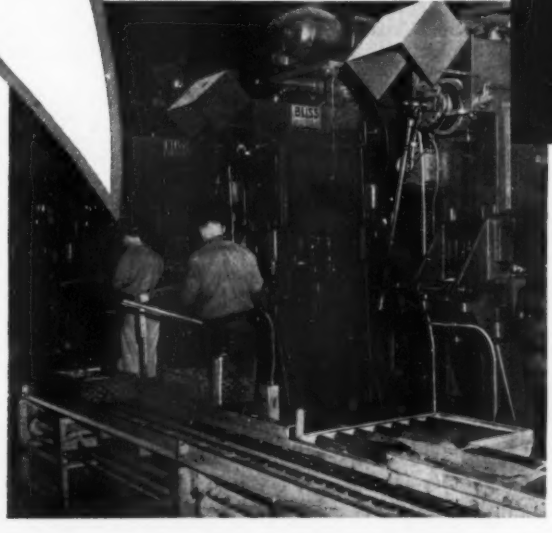


**AT SCHENECTADY, NEW YORK:** These batteries of Bliss Inclinable presses are used for a variety of metal-forming operations.

**AT DANVILLE, ILLINOIS:** Two lines of Bliss High Production presses with progressive dies produce laminations for fluorescent lamp transformers. All were designed with high legs to accommodate material equipment.



**AT SAN JOSE, CALIFORNIA:** Two of several specially designed Bliss straight side presses in fixed inclined position have stack feeders. Rigid press construction is vital for precision lamination punching at high speed.



"One or Several Copies Are Needed in Any Shop Doing Stamping Work"...*American Machinist*

**Completely New**

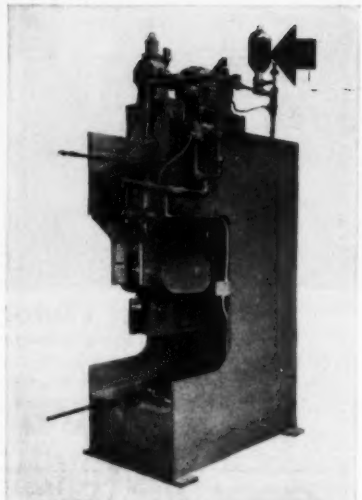
**700 Pages • 450 Illustrations**

Sections on: Computing press jobs • Selecting proper press • Useful engineering tables • Die illustrations • Complete glossary. Plus a service section for Bliss presses. **$7.50**

E. W. BLISS COMPANY—Handbook Dept., Canton, Ohio

**TO A COMPLETE PRESS ROOM... *It's Bliss***

# More Power to You!



## ACTUAL CASE HISTORY

By incorporating one Greer Accumulator in the Weld Roller illustrated, Mr. Charles Grotnes, vice-president of the Chas. Grotnes Machine Works, Inc. of Chicago replaced a large pump and motor with a much smaller power unit, resulting in a saving of $100.00. The accumulator also provided a 50 to 75% speed increase on the return stroke.

**Will they do even more than this for you? Get the facts from our engineers! Call or write for Greer Bulletin 300.**

## Get many times the horsepower of your power source with Greer Accumulators!

A rubber balloon in a steel cylinder – such a simple way to boost efficiency and save money! This ingenious power package – the Greer Accumulator – makes it possible to replace large motors with much smaller power units, for intermittent hydraulic operations. (See case history for one example of this.)

Multiplying horses is perhaps the most spectacular use for Greer Accumulators – but there are other applications equally important. They act as shock-absorbers in pipeline systems, protect rock crusher mechanism against unbreakable rocks, even dispense fluids to speed processing of mayonnaise or peanut butter.

It is a rare hydraulic circuit that cannot, in some way, be improved with the addition of one or more Greer Accumulators. They can compensate for pressure valve leaks, provide auxiliary or emergency power sources, pressure transfer barriers, power supply for secondary circuits.

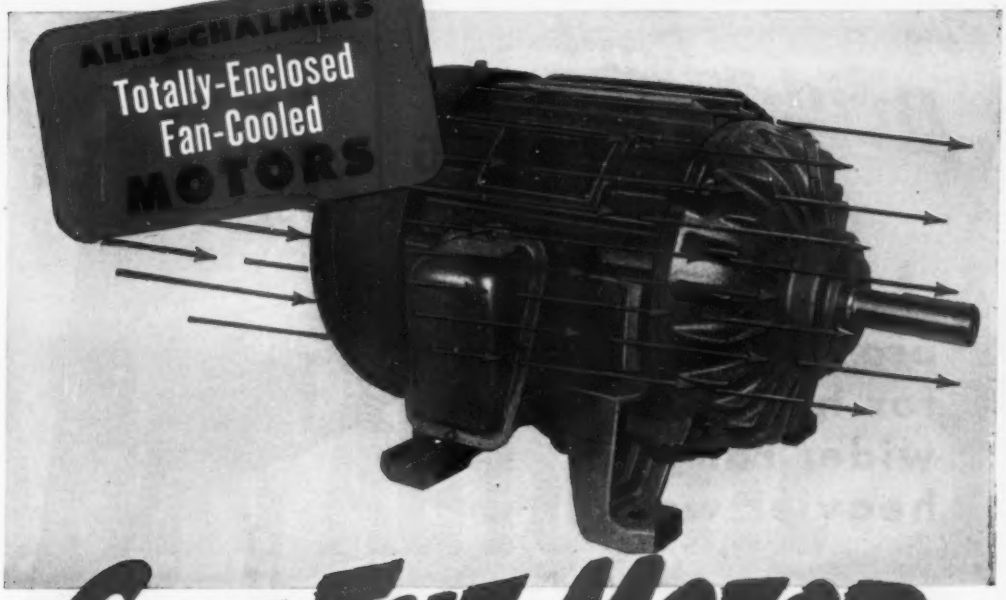
Greer engineers are waiting to discuss your particular problem or requirement. There is no cost, no obligation. Call today – or write for Greer Bulletin 300. It's free!

**GREER ACCUMULATORS**

U. S. PATENTS UNDER OLEAR LICENSES

**GREER HYDRAULICS INC. · 453 EIGHTEENTH STREET · BROOKLYN 15, NEW YORK**

Sales Representatives in All Principal Cities • District Office: 407 South Dearborn Street, Chicago 5




# GET THE MOTOR that Cleans Itself

DROP YOUR MAINTENANCE COSTS to a new low by reducing motor cleaning operations and reducing inspections and overhauls. Tests have proved that on most applications totally-enclosed, fan-cooled motors more than pay back their extra cost in reduced maintenance. And this new Allis-Chalmers Type APZ tefc motor makes maintenance costs lower than ever before on this type of motor.

### Here's Why

Concealed air passages and pockets have been eliminated; dirt cannot build up to cause overheating. Cooling air is blown over the ribbed cast iron frame and bearing housings carrying dirt away with it. How about oily dirt that sticks? It can be wiped or blown off without stopping the motor.

### Rigid Construction

The frame is rigid cast iron which not only has high inherent corrosion resistance, but also holds bearings in alignment. Bearings are pre-lubricated at the factory and should need no attention for years. Tapped holes with pipe plugs to permit regreasing and to provide grease relief are standard equipment.

### Get All The Facts

The new Allis-Chalmers Type APZ totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224* to 505. Also in explosion-proof type. Your A-C Authorized Dealer or District Office has complete information. Call today, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B6144.

A-3398

**Sold . . .**
**Applied . . .**
**Serviced . . .**

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

**CONTROL** — Manual, magnetic and combination starters; push button stations and components for complete control systems.

**TEXROPE** — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

**PUMPS** — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

*Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks.

**ALLIS-CHALMERS**

*Similar design non-ventilated motors Type APK, also available in frames 203 to 224 inclusive.

*The*

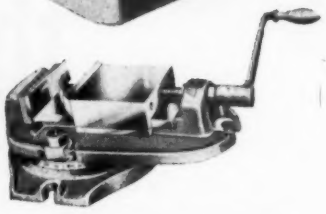
# *Bridgeport* TURRET MILLING MACHINE

## *with its NEW 1 H.P. HEAD*

## provides capacity for handling a wider range of heavier work

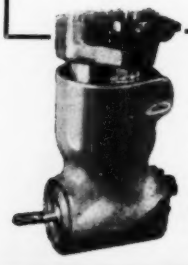
With a record of versatility already established in tool rooms and production lines of countless shops (more than 13,000 machines in service in only 12 years) the new "BRIDGEPORT" 1 H.P. milling, drilling and boring head provides even greater machining possibilities . . . in increased capacity and ability to handle larger work.

Among the features of this machine are: 8 spindle speeds from 80 to 2720 R.P.M. . . . back geared spindle drive unit utilizing full power at all speeds without belt slippage . . . a quill travel of 5" . . . power feed to quill in three steps . . . positive 2-way power feed stop tripping mechanism . . . spindle lock and brake . . . and a collet capacity up to ¾" diameter. Investigate the possibilities of the "BRIDGEPORT" on your work . . . send for complete details on the machine and its attachments.



**MILLING MACHINE VISE**

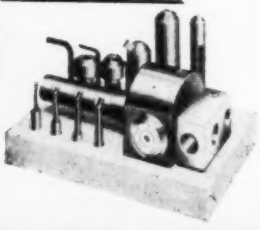
This improved vise, attractively streamlined, assures greater gripping power provided by a large diameter screw. A coolant trough adds to its utility. Made in two sizes: 5"x3½" and 6"x 5" jaw openings.



**RIGHT ANGLE ATTACHMENTS**

(Left) Heavy Duty attachment (made in two sizes) applicable to Master as well as 1 H.P. Bridgeport heads.

(Right) Light Duty type for milling and drilling narrow, deep molds and cavities.



**NO. 2 BORING HEAD**

With this attachment, holes up to 6" diameter can be bored. It is applicable to the Bridgeport 1 H.P. Milling, Drilling and Boring Attachment.

***Bridgeport*** **MACHINES, INC.**

*Bridgeport, Connecticut*

*Manufacturers of High Speed Milling Attachments and Turret Milling Machines*

# You're always right with AUTO-LITE Die Castings

● Many of America's leading manufacturers, producing a wide variety of products, are benefiting from Auto-Lite die cast research, experience and advancement. Such developments as high pressure casting, special alloying practices and improved quality through the "controlled metals process" make Auto-Lite the logical source of supply for precision die castings. Address inquiries to:

**THE ELECTRIC AUTO-LITE COMPANY**
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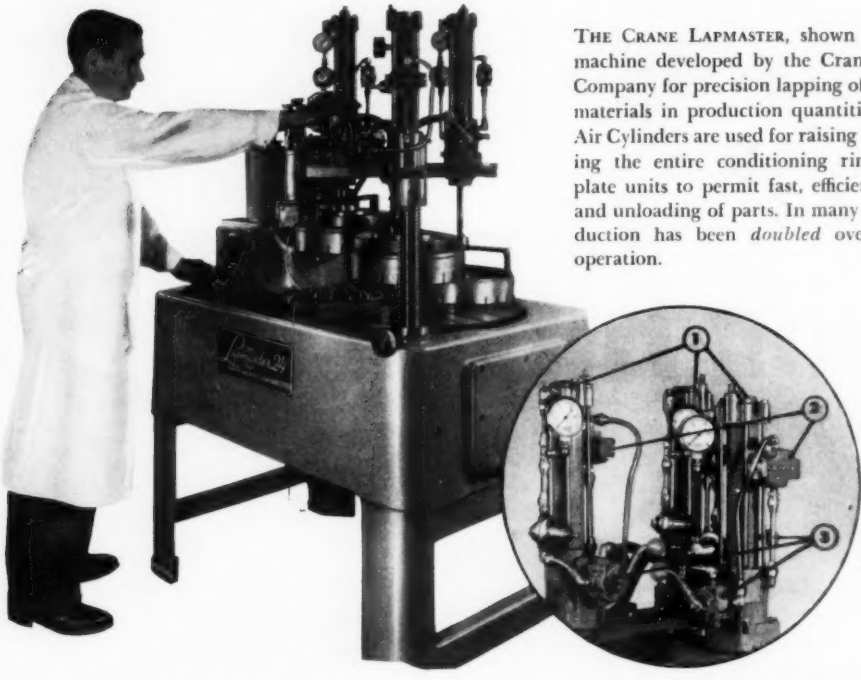
IN THIS LAPPING MACHINE

# Hanna® Cylinders and Valves

## INCREASE SPEED—REDUCE OPERATOR FATIGUE



THE CRANE LAPMASTER, shown here, is a machine developed by the Crane Packing Company for precision lapping of parts and materials in production quantities. Hanna Air Cylinders are used for raising and lowering the entire conditioning ring-pressure plate units to permit fast, efficient loading and unloading of parts. In many cases, production has been *doubled* over manual operation.

Hanna Air Cylinders (1), Speed Control Valves (2), and Unitite Jr. Valves (3), are shown in this close-up view of the Lapmaster.

The application of Hanna Cylinder Power to the Crane Lapmaster is a typical example of the way many types of machines and equipment can be operated faster, easier, more efficiently and with less cost. For Hanna Cylinders and Valves are adaptable to hundreds of installations to raise or lower, push or pull, press, clamp or control – *smoothly* and *reliably*.

If you are looking for a way to increase production and lower operating costs of your machines or equipment, investigate the advantages of Hanna Cylinder Power. Hanna Sales Engineers, experienced in applying hydraulic and pneumatic cylinders in a broad range of installations, will be glad to help you.

### *Send for Catalogs*

*Hanna Catalog 236 for Low Pressure Cylinders—Catalog 233A for Hydraulic Cylinders.*

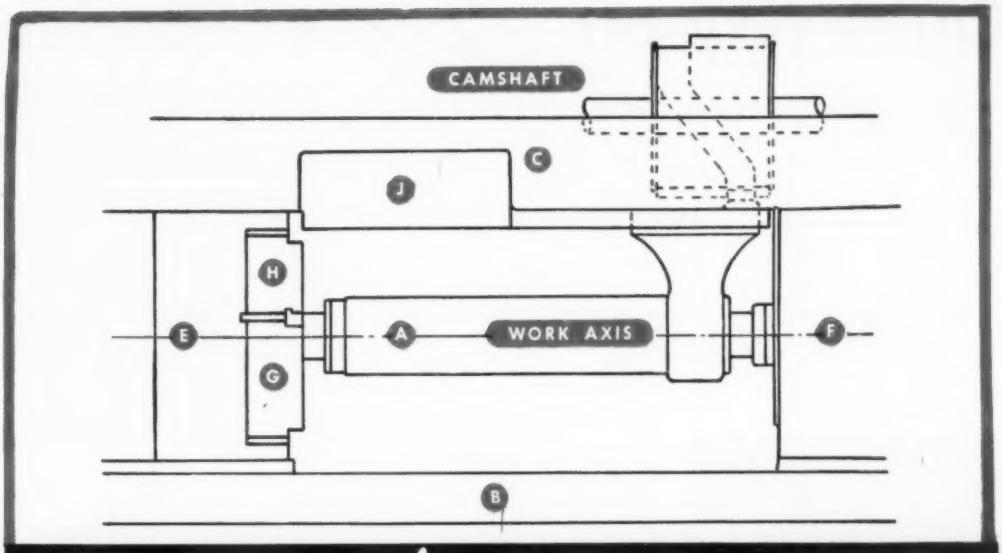
*Hanna Catalog 254 gives full information on the complete line of Hanna Valves.*

*50th Anniversary 1901-1951*

## Hanna Engineering Works

HYDRAULIC AND PNEUMATIC EQUIPMENT . . . CYLINDERS . . . VALVES . . . RIVETERS

**1765 Elston Avenue, Chicago 22, Illinois**




# THE *good* THAT MEN DO

The horizontal design Tooling Area, shown above, is a contribution by Frank L. Cone to the improvement of the Multiple Spindle Automatic Bar Machine that will live long after him. The advantages, stated below, are made possible by the machine's Overhead Camshaft. Specific data invites comparison.

## THE TOOLING AREA OF THE CONOMATIC (1½" Six Spindle):

1. **Handles longer work than can be handled by the tooling area of any other "automatic."**

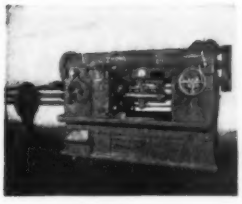
   *The length of the Tooling Area is 46 1/16 ins., which permits standard machining operations on work up to 18 ins. in length from the face of the cut-off tool.*

2. **Is more strongly supported by the machine frame than is the tooling area of any other "automatic."**

   *The stocky Uprights, E and F, which are shorter than those of other "automatics," are securely bolted to — and held between — the Top Bed, C, and Base, B,* which are larger and heavier than such members of other "automatics." *The Uprights are 22" high. The Top Bed is 8" high, 23" wide and 103¾" long. It weighs 1232 lbs. The Base is 33⅜" high, 46" wide and 110" long. It weighs 6655 lbs.*

3. **Provides more Tooling positions than does any other "automatic."**

   *The Main End Slide, A, has 6 positions. The Main Cross Slides, G and H, front and rear, have 6, and the Auxiliary Cross Slide, J, front and rear, are 2 more, which make a total of 14.*



*Buyer's Comparison Chart will guide you to full information*

**A Comparison of ALL Automatics is in Favor of Cone**

**Conomatic**

**CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.**

# Quick pay-off - - 2 case histories

**Automatic drilling and tapping machines pay for themselves in 1 to 3 years by cutting costs of high production parts to pennies.**

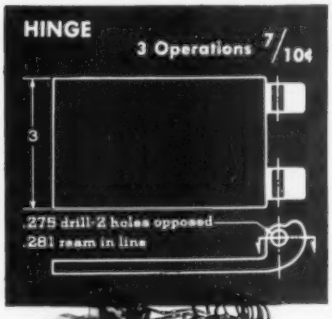
Dear Sir:

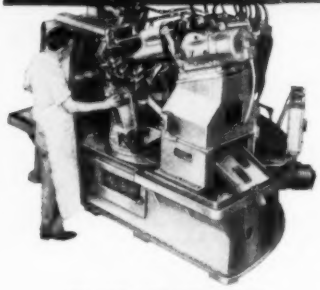
These 2 machines save money. That is the only reason for their existence.

They will pay for themselves in 1 to 3 years. Their owners, like all our customers, are impatient to get their investment back. If a Kingsbury's pay-off period ran over 3 years, they would keep on using their old equipment.

**How automatic machines cut costs**

Operations are in accurate location. (Bushings guide drills and reamers. One chucking instead of several.)



750 PARTS AN HOUR GROSS

While the man drops 3 hinges into nests, the machine clamps and drills 3 parts, reams 3 parts and ejects 3 parts down the chute. Then he presses a lever and the table indexes.

- 2 units drill from opposite ends at the left station. One unit reaches across the index table to drill from the rear.
- The rear unit reams both pin holes with a 6-inch stroke.
- Air cylinders operate levers to clamp the work automatically.
- All units have 3-spindle auxiliary heads to work on 3 parts at once.
- The machine can operate on similar hinges.
- Bushings guide the drills.
- An interlock prevents the table from indexing until every tool is withdrawn.

Parts are uniform. (Automatic cycles do not vary Fixtures are identical duplicates.)

Saves floor space. Reduces handling.

But the real big reason is this: More output per man-hour. The operator chucks the work. The machine finishes the job. You can say this about a Kingsbury: Cost is low when production is high.

Sad to say, the opposite is also true. Cost is high when production is low. If you have a tough problem with accuracy or uniformity, a Kingsbury may *still* be a good investment. But if your production runs are short and you do not worry about accuracy, you might just as well turn the page.

**Kingsburys do many different jobs**

Jobs can be simple or complex — operations few or many, from one direction or several, simultaneous or successive. Holes can be from the smallest up to 1 inch (5 hp).

To find the most efficient setup for each job, we select from a complete line of standard equipment. Just look: 12 automatic drilling and tapping units with 82 standard attachments; 8 standard units and 18 standard bases. There are 4 basic types of indexing machines and 2 types that do not index.

**What standard units do**

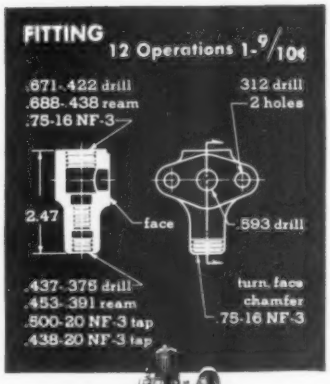
Kingsbury units drill, tap, counterbore, hollow mill, thread, spot face, ream, etc. Attachments mill light cuts in the same chucking with these operations. Multi-spindle auxiliary heads perform similar operations of about the same speed and feed.

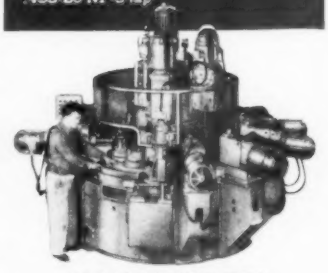
**How about sending us a print?**

Let's get down to cases. Let us tell you exactly what a Kingsbury can do for you. Send us a print of a high production part and identify the operations and tell us the hourly output you need. If it is complicated, we'd like a sample part too. Our sales manager says it makes the job easier to visualize, but there is more to it than that. He leaves it on his desk; the general manager spies it; a sales engineer joins them. When the argument gets noisy we know they are working out something. You'd be surprised at the ideas they dream up that way Some of them are darned ingenious.

Sincerely yours,
Kingsbury Machine Tool Corp.
70 Laurel St., Keene, N H.

P.S. Here is the basis for costs in the case studies. 80% efficiency Machine paid for after only 6000 hours, a fraction of its expected run. Wage rate above national average No power or overhead included.



605 PARTS AN HOUR GROSS

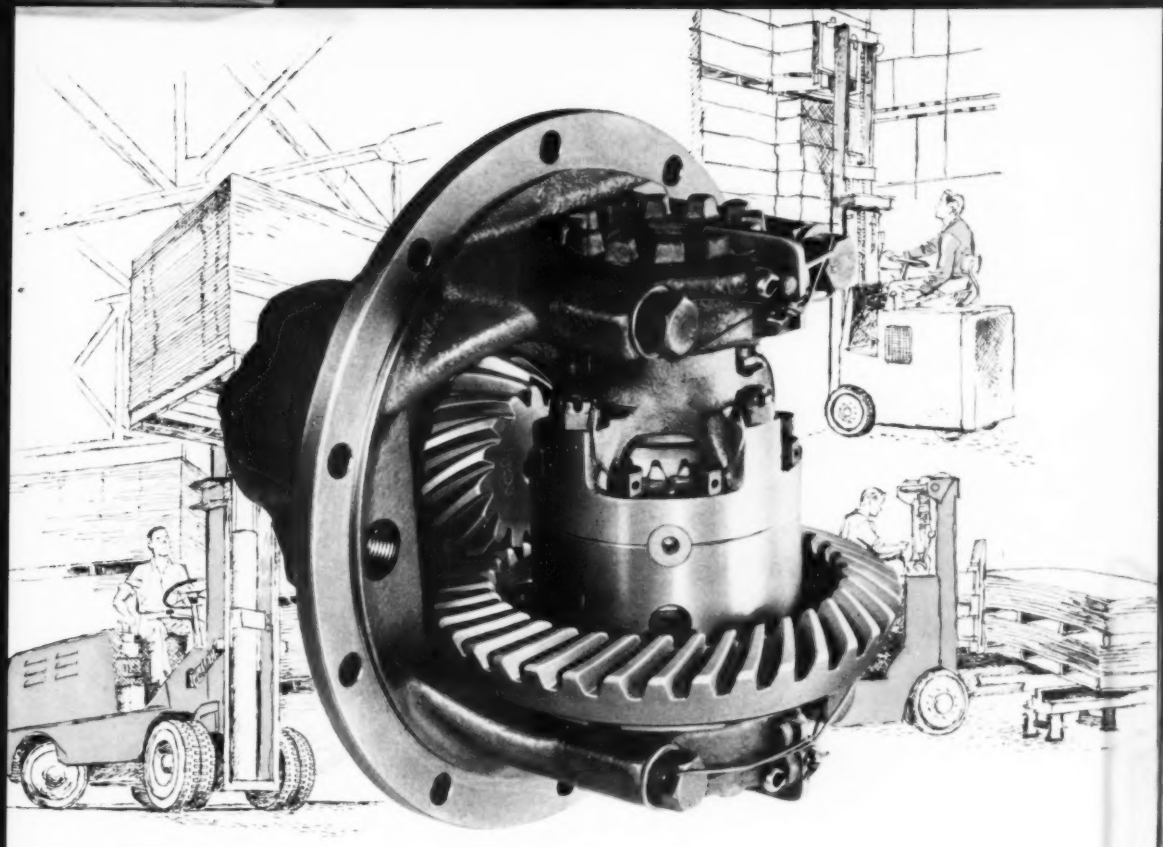
When the table indexes, every chuck rotates 180°. Horizontal units can then work on opposite ends of the fitting. While the man changes parts at the loading station, 4 vertical and 8 horizontal units operate on the parts at 11 working stations.

- A power wrench rotates a screw on each chuck to open and close it quickly.
- 12 self-centering two-jaw chucks are exact duplicates.
- Control is all-electric and meets Automotive Electrical Standards. Control devices are in a separate sheet metal cabinet away from the machine (not shown).
- A plexiglas splash guard hangs from the ceiling. The man lifts it to reach the tools.
- Bushing plates pilot onto locators on the chucks to align the tools.
- The column for the 4 vertical units is in the center so all tools are in easy reach. The working area is not caged in.
- Indexing can be automatic or under the control of the operator. He can jog the table part way for setting up or changing tools.

84

**KINGSBURY**

AUTOMATIC DRILLING
AND TAPPING MACHINES
*for Low-Cost High Production*



# Muscle for America's favorite WORK HORSE

A great development of all-round usefulness to American industry is the fork lift-truck. Today, these swift, efficient machines are pacing the flow of materials in almost every American industry.

In thousands of fork lift-trucks you'll find transmission and differential assemblies made by Automotive Gear Works, Inc. Few gears of any type are exposed to such constant, heavy-duty use. This is particularly true now with increased three-shift production; with trucks working on every kind of flooring and terrain, rough or smooth, indoors or outdoors; and often handling loads greater than recommended capacities. Even under these circumstances "Double Diamonds" are providing dependable, trouble-free "muscle" for hosts of these hustling work horses.

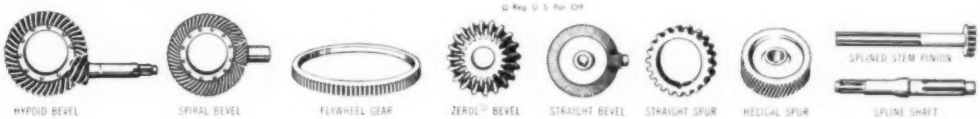
The fact that "Double Diamond" Gears are preferred by leading fork lift-truck manufacturers may suggest the advisability of calling in a "Double Diamond" engineer when you next need gears of the many types we manufacture.

DOUBLE DIAMOND TRADE MARK GEARS

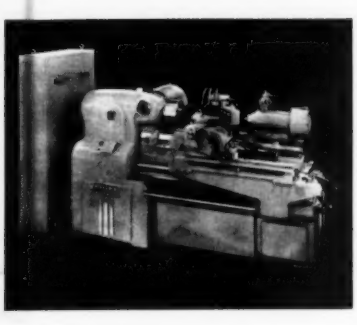
## AUTOMOTIVE GEAR WORKS, INC.

RICHMOND, INDIANA

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS



# Investigate Monarch Lathes for Important Savings



**THE MONARCH MONA-MATIC**

—the greatest development today for high speed, automatic metal turning. *Write for proof* in the form of a wide variety of performance records established under typical production conditions.

*Have you investigated recent Monarch turning developments?* There's only one truly effective way to sharpen your pencil on manufacturing costs today. That's to insist on taking full advantage of modern equipment and methods.

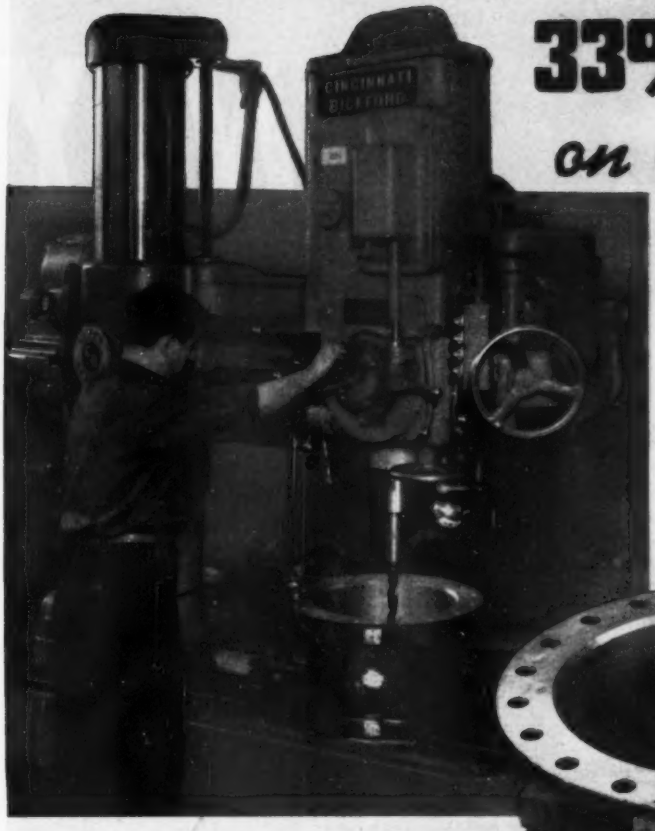
Users of Monarch tracer-controlled lathes, for instance, report time-savings of up to 500% and more. There are jobs where one machinist, operating two single tool tracer-controlled Monarchs, is outproducing 4 multiple tool automatic machines. Or where tool costs alone have been reduced over $4,000—or setup time by over 27 hours—or subsequent grinding time by 50%. There are Monarch installations that have written off their costs in less than a single year of cost-saving operation. And please bear in mind that the average set-up time of 15 to 20 minutes makes these modern Monarchs as economical for short runs as for long ones.

You can count on accuracy, speed and long service with every Monarch lathe. And we build almost every type. We can apply any one of our three kinds (3 kinds!) of tracer controls to many of them. Let us give you full details of Monarch Toolmaker's, Engine and Production Lathes—and of Monarch-Keller, Air-Gage Tracer and Motor Trace Controls. Just tell us your interests . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

**Monarch**
ACCURACY • ECONOMY • LONG LIFE
**TURNING MACHINES**

**FOR A GOOD TURN FASTER — TURN TO MONARCH**

# 33⅓% SAVED on Cast Steel




Satisfactory experience with other Cincinnati Bickford Super Service metal drilling machinery induced The R-S Products Company of Philadelphia, Pa., to install this 4' arm 13" diameter Column Super Service Radial.

They say, "Ease of handling has reduced operator fatigue and consequently has increased his productive capacity."

On these cast steel Butterfly Control Valve Bodies the floor to floor time on the previous machine was three hours, this same job, is now being done in two hours—a 33-1/3% savings.

4' arm 13" diameter Column Cincinnati Bickford Super Service Radial, drilling forty 1-1/4" diameter flange holes through 1-3/4" - 20" diameter Cast Steel Valve Body.

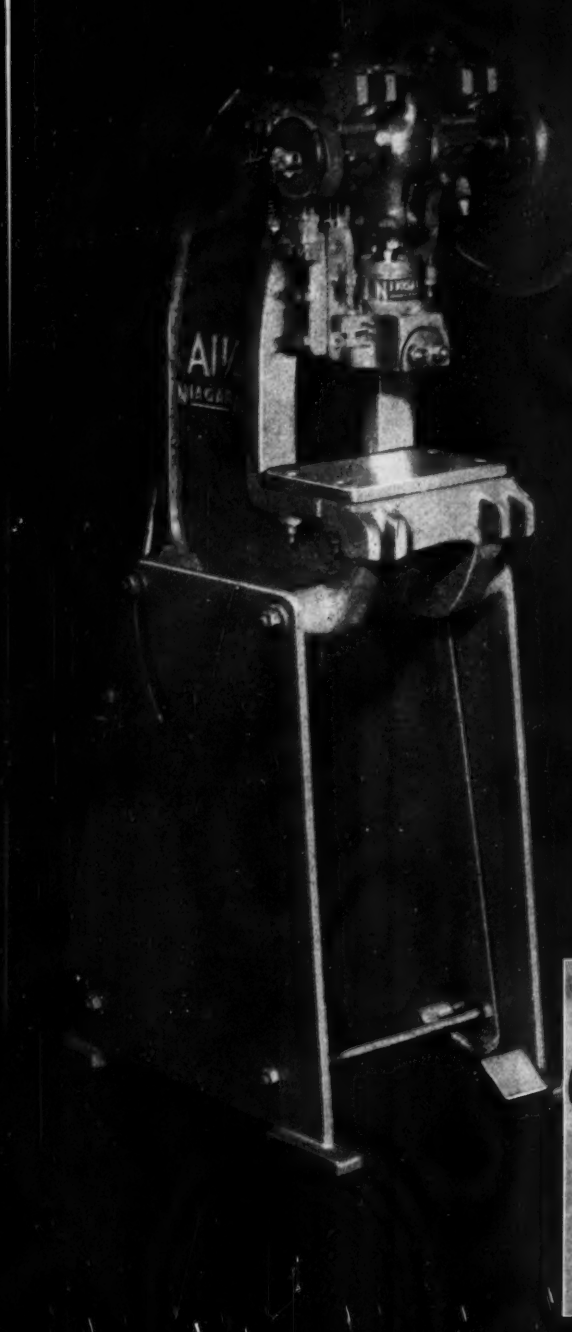
*Equal Efficiency of Every Unit Makes the Balanced Machine*

Good judgment in selecting the proper machines, tools, and fixtures will consistently produce the best manufacturing results. Our CUSTOMER PRODUCTION ENGINEERING SERVICE in the metal drilling field represents the collective experience of many years (since 1874). Make your problems ours - - let us show you a profitable Radial or Upright Drill production application. Your most urgent production problems warrant our immediate attention.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½" dia. col., 8½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines

**THE CINCINNATI BICKFORD TOOL CO.** Cincinnati 9, Ohio

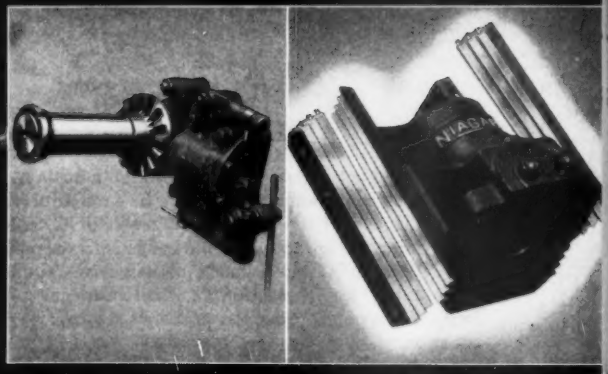


# ONLY

● You get the same advanced design in small Niagara Inclinable Presses as you get in the largest sizes. Don't overlook the importance of this because small presses run as much as 6½ times as fast as large presses. Regardless of size you get quality when you get Niagara Inclinable Presses.

*Instant Engagement* of the Sleeve Clutch as compared with the slower action of other mechanical press clutches produces more work strokes per hour.

*Multiple "T" gibs* provide more guiding surface which minimizes wear, maintains alignment of slide with bed and thus increases die life.



NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

# NIAGARA

## SMALL INCLINABLE PRESSES

*Give you all these*

# BIG PRESS FEATURES

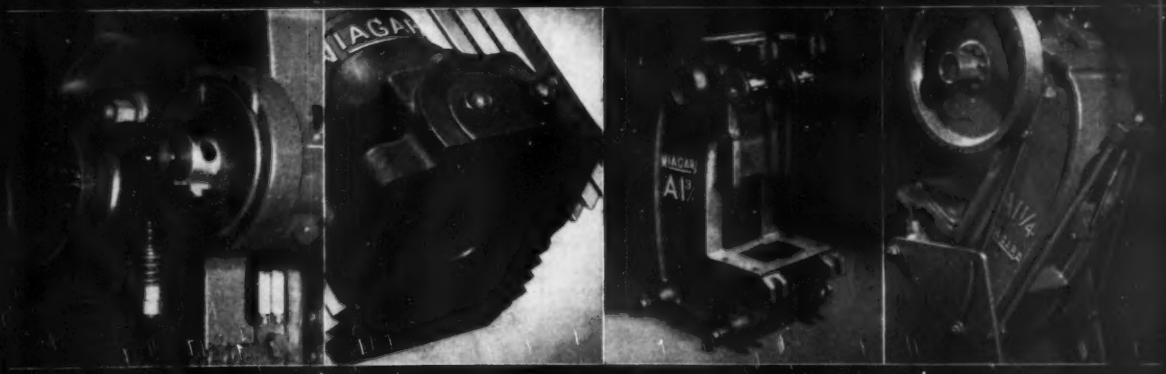
## FOR YOUR DEFENSE PRODUCTION

*Brake automatically* compensates for wear as well as expansion due to heat of operation. Drum and band marked to indicate correct adjustment.

*Slide* [illegible] to assure solid backing for die from center to front as well as rear. Breech block die clamp gives solid backing to punch shoe.

*Frame designed* to provide solid gib mountings, [illegible] strength at the crankshaft bearing and a rigid gap maintaining close alignment of punch and die.

*Inclining mechanism* easily operated by one man. Working height is not materially changed when press is inclined.




DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

"Take your time, boys. My Harry has a grip like a JACOBS CHUCK!"

IF IT'S A

JACOBS

IT HOLDS

THE JACOBS MANUFACTURING CO., WEST HARTFORD 10, CONN.

# Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

## Die Life Troubles

In reference to "Die Life Test Cuts Cost of Laminations," (*AM*, Nov. 27, 1950), are precautions taken to have the grain of the metal running the same way for all punches and dies? We have found that punches made with the grain in a plane horizontal to the tool are prone to flaking. In the die we have found that if the grain is in a vertical plane, the die is more subject to bell mouthing than if it is made with the metal in a horizontal plane.

In view of this article, we plan to make some experimental tools of carburized high-speed steel for stamping nickel-iron laminations. Have any tests been made on this, and if so, what results have been obtained as regards pick-up? Pick-up and minute chipping are our main headaches and we have always felt that the grade of tool steel has a bearing on this, although we have no evidence to support it.

J. A. Holden
*Magnetic & Electrical Alloys, Ltd.*

*Punches and dies were made with their longitudinal axes parallel to the direction of rolling. We follow this procedure on actual production dies. Some of your trouble might be associated with poor-quality tool steel. Ours is rigidly inspected, and we do not use bars containing defects such as porosity, excessive carbide segregation, excessive decarburization, etc.*

*We have not conducted any tests with carburized high-speed steel on*

*high-nickel laminations. We suggest you investigate the surface finish of punches and dies. Many reports indicate that a surface roughness of less than three micro-in. will give better life, and a smooth surface should reduce your galling difficulties.*

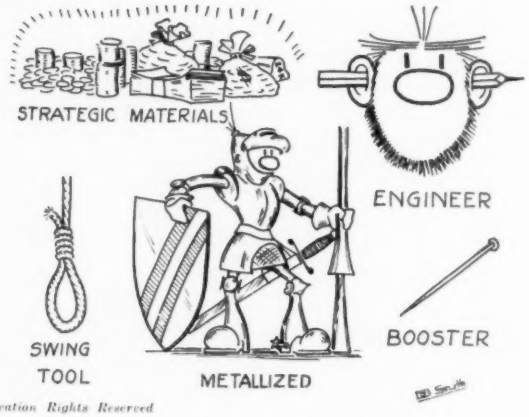
A. T. Hamill
*Westinghouse Electric Co.*

## Repairing Broken Shafts

I am very sorry to observe the following: Probably because of my poor English, the idea on repairing a broken crankshaft in an emergency or to couple the ends of two shafts

## GRINETICS

BY D. G. SMITH

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## Rivett 918 "Steelway" Turret Lathe

Now you can produce small duplicate parts speedily in unlimited quantities with precision known only to the toolroom!

For here's a lathe that's been developed out of the bench class into a production machine. It has all the inherent precision for which Rivett has long been famous, plus time-saving features that reduce set-up and cutting operations to a fraction of that normally required. Single part production can be powered and cycled automatically.

Any one of 120 to 3750 RPM cutting speeds may be instantly and accurately selected; newly designed collets increase speed of operation as well as accuracy and gripping power; automatic chuck closer and well grouped controls step up operator time.

Bulletin 918ST will give you all the details. Write for your copy today.

**RIVETT** | **LATHE & GRINDER, Inc.**

*Dept. AMR5, Brighton 35, Boston, Massachusetts*

For More Precision Work *RELY ON RIVETT LATHES AND GRINDERS*, The Master Craftsman's Master Tools

DEFENSE JOBS

THREADED at HIGH SPEED!

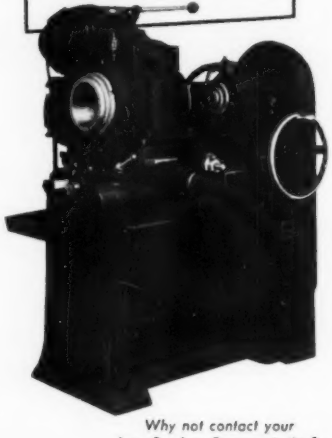
Versatility to handle changing defense requirements is an outstanding characteristic of the Model 40.

This thread miller, ideally suited for continuous, grueling high production work such as that illustrated, can, when desired, be used to equal advantage on short run, small lot assignments. Versatility—made possible because the design of the Model 40 is such that it can be changed over from one assignment to another with ease and speed.

*Why not investigate* the advantages of the Model 40 Thread Milling Machine applied to your precision threading requirements?

FOR CONTINUOUS HIGH PRODUCTION WORK

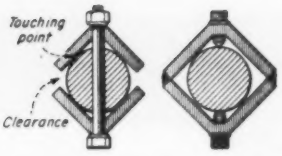
FOR SHORT RUN ASSIGNMENTS



*Why not contact your Lees-Bradner Representative?*

The LEES-BRADNER Company

CLEVELAND 11, OHIO, U S A




by means of angle irons and bolts has not been interpreted well. The sketch, as well as the description, describes a different way to do the job (*AM* Jan 8, '51, p 121).

The left-hand sketch gives the principle of my idea. It is easy to follow, requires no welding, and gives good alignment. It is essential that the angle irons do not touch, and that the bolts cross through the shafts. These may be held by lockwashers.

The second sketch shows the way the idea was illustrated in the magazine, and from this you can appreciate that no alignment will be obtained. Welding is necessary, which may bend the angle irons. Using setscrews will mean that the shafts must be held only by the setscrews themselves; not the angle irons. Welding a closed box and using setscrews would be a possible way to do the job, but setscrews would have to be located on one side of the box only, so the shafts would bear against two flanges of the angle iron and setscrews.

Pablo Redl
*Buenos Aires, Argentina*

EDITOR'S NOTE: *Because of the author's natural unfamiliarity with our shop jargon, we did misinterpret his idea. Unfortunately, his original sketch didn't show the bolts going through the shafts, however.*

## Straightening Out the Centerless Attachment

In my article, "Duplicator With Centerless Attachment Machines Extra-Large Curves", (*AM* Feb 5 '51, p 158) the method of finding the angle of setting should be arrived at by dividing the diameter of the desired curve by the distance between the trunnion centers. The resulting figure is the secant of an angle which in all cases is 90° smaller than the required angle of setting. By graduating the device so it reads 0 when the arms are at right angles, the addition of 90° is always included, and the simplified formula may then be stamped on thus:

$$\text{Secant of angle of setting} = \frac{\text{desired diameter}}{\text{trunnion center distance}}$$

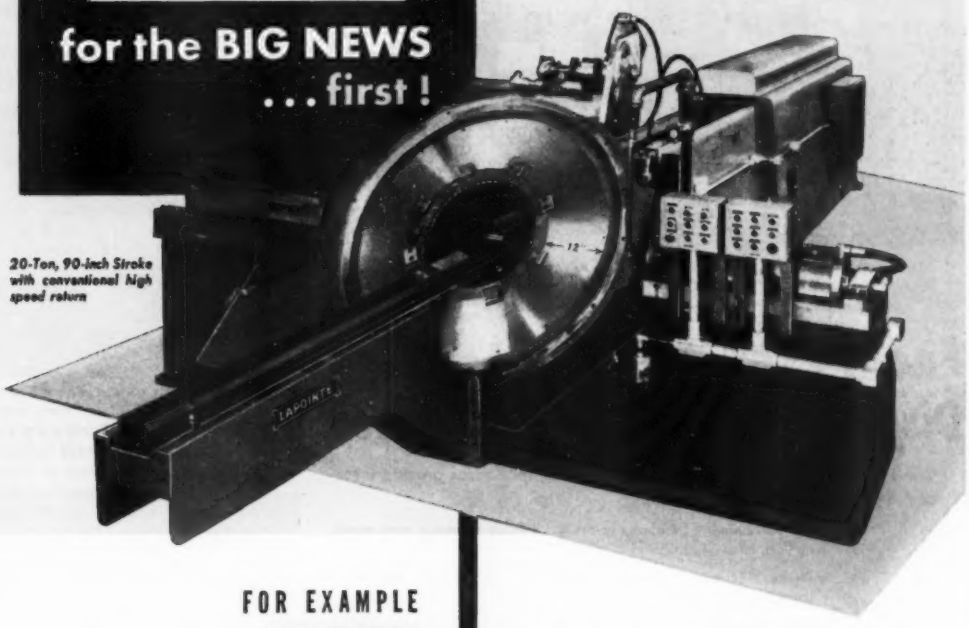
Adolph B. Harvest
*Humber Bay, Ontario*

Look to

LAPOINTE

for the BIG NEWS ... first!

*The straight-line, horizontal pull is the most efficient, most accurate broaching method for cutting slots in stator wheels for use in locomotive gas turbine engines or stationary power plants.*



*20-Ton, 90-inch Stroke with conventional high speed return*

FOR EXAMPLE

this LAPOINTE

H-P 40 SPECIAL

**HORIZONTAL BROACHING MACHINE**

**has a LAPOINTE-ENGINEERED fixture that will accommodate all sizes of STATOR RINGS from 30" to 48" in diameter!**

Built with adjustable travel of 15", hydraulic index, hydraulic plunger and fully automatic lubrication, this fixture makes possible the precision broaching of 40 to 100 slots in stator rings or wheels at the high production speed of 35 seconds per slot!

**What's *your* broaching problem?**

Lapointe can give you the *right answer,* for Lapointe has the experience, the plant, the personnel to engineer your *entire broaching job:* machines, tools, and fixtures. You are always safe, when you *leave it to LAPOINTE!*

*Write for illustrated technical Bulletin HP-2*

THE *Lapointe* MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

*Branch Factory: Watford, Herts., England*

LAPOINTE

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

*This shop dispatching system proved so satisfactory, that it has been extended throughout the Jacobs (Chuck) Manufacturing Plant . . . even in the engineering drafting department, insuring . . .*

# Fool-Proof Machine Loading, Dispatching and Job Assignment

One four-copy form and McCaskey Machine Control Boards provide these and numerous other cost-cutting results:

Visual Scheduling . . . a glance at the board shows volume of work ahead for each machine or man.

Sequence of Orders . . . quickly indicated by arrangement of tickets representing the orders.

Schedule Changes . . . simply made by rearranging tickets to specify new sequence.

No Delay Between Planning and Dispatching . . . no lists or records to change.

Operation According to Plan . . . assured without consulting supervisor for assignments.

Subordinates Quickly Trained and Work Delegated . . . close supervision easy.

The system is so flexible that it is readily adapted to production, assembly, maintenance and construction work of every variety, using shop orders, time tickets, move tickets, tabulating cards, etc. with the Boards.

***Mail the coupon today for complete details.***

THE McCASKEY REGISTER CO.
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Please send me folders describing McCaskey Machine Loading, Dispatching and Job Assignment.

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AM 5-51

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INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL


## Induction Hardening Screw Machine Steel

Several letters received recently pose this problem. "Recently we switched from furnace hardening to induction hardening as a direct part of our screw-machine operation cycle. We have found that the steel regularly used failed to come up to full hardness, and it was necessary to change alloys before proper hardness was obtained. Usable alloys were only found after long and tedious experiment. Is there any chart available which shows which alloy steels are suitable for induction hardening?"—Editor

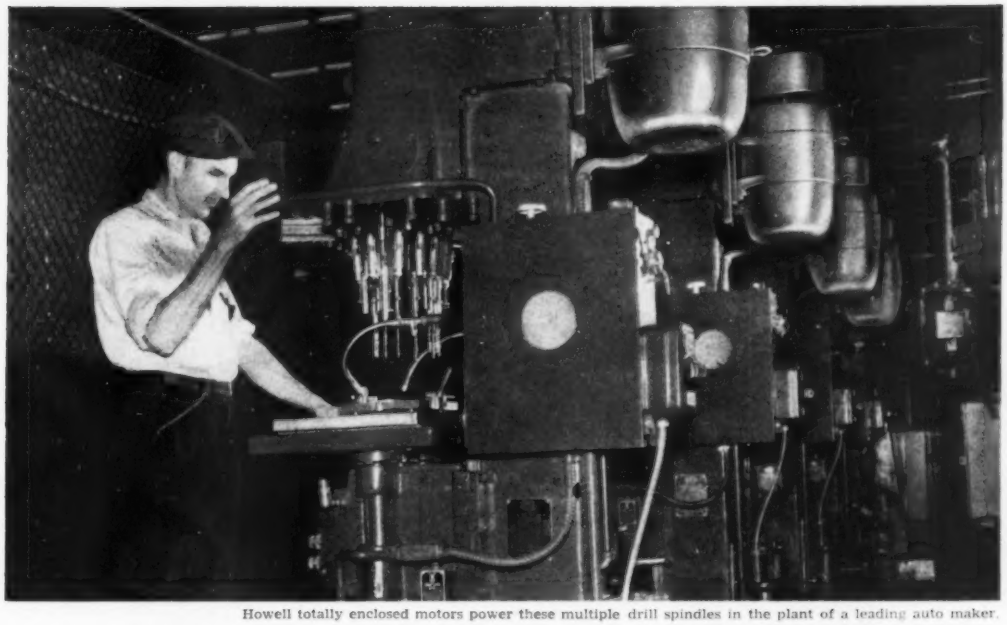
*. . . Actually, any steel that can be hardened in any other way can be induction hardened. Some alloy steels can be made even harder by induction than by other forms of heating in that a "super hardness" of 4-5 $R_c$ higher than normal often results from the induction effect.*

*However, alloy steels containing chromium, molybdenum, and vanadium (4150, 4340, 6150) require more time for these elements to go into solution, hence must be held at heat for a longer period than is customary with an induction source. When a furnace is used, more than sufficient time is provided. The fast heating cycle (perhaps 5 sec) often used with induction does not provide enough time.*

*Straight carbon steels and nickel-alloy steels (1100, C1144, A2330) are most suitable for induction hardening as they go into solution rapidly. The difficulty may be overcome in two ways: Best corrective measure is to increase induction heating cycle, perhaps 4 times in average cases, until full hardness is reached. If this is not possible, as a result of a tight screw-machine cycle, even with multiple hardening, then the steel must be changed to a composition which will go into solution within the permissible time.*

*Multiple hardening means providing equipment to harden a number of parts at one time. Thus the time cycle may be increased and still keep pace with machine output.*

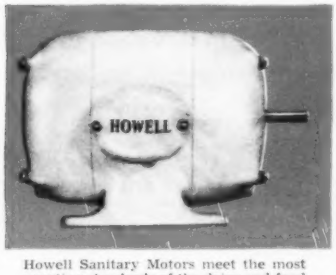
Henry Petersen, Pres.
*Lepel High-Frequency Labs, Inc.*



Howell totally enclosed motors power these multiple drill spindles in the plant of a leading auto maker.

# HOW MUCH ARE ELECTRIC MOTORS WORTH?

Howell Type K Motor. Offers constant performance in the presence of dirt, dust, fumes and moisture. Sizes from 3 to 150 H.P. at 1800 R.P.M. Either vertical or horizontal mounting.




Howell Sanitary Motors meet the most exacting standards of the dairy and food industries. They contain no pockets, cracks, or crevices. Available for vertical or horizontal mounting.

The actual cost of the motors you see pictured here amounts to hundreds of dollars.

But their true worth, in terms of supplying the power for these multiple drill spindles to turn out finished parts, runs into thousands.

It's tough applications like this which prove the real value of Howell Industrial Type Motors. For your jobs, Howell serves three ways: (1) by engineering electric motors to your job; (2) by furnishing motors of the highest quality; (3) by serving you after the sale.

May we apply our facilities and engineering ability to your problems?

**HOWELL ELECTRIC MOTORS COMPANY**

**Howell, Michigan**

HOWELL Red Band MOTORS

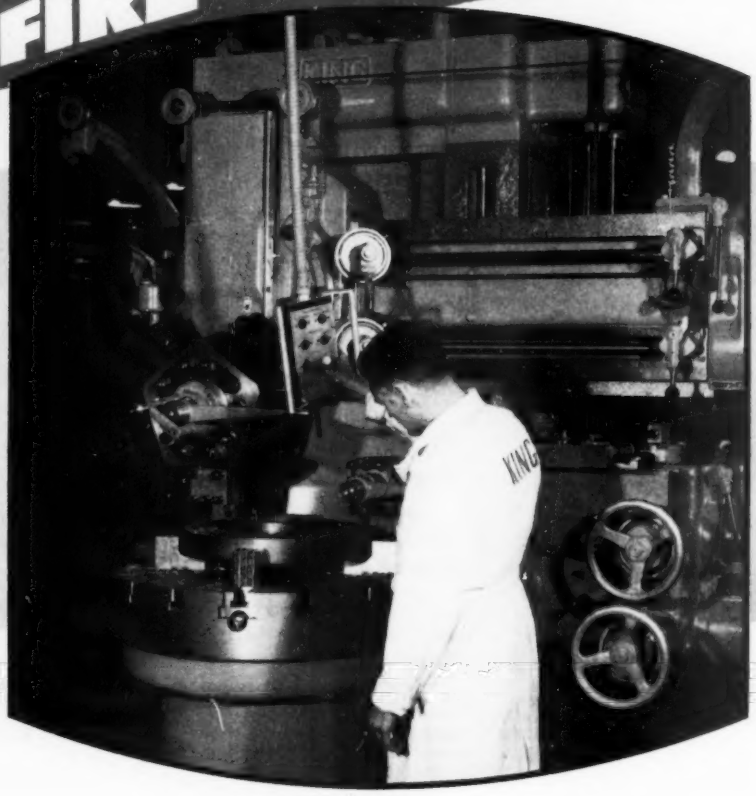
**HOWELL MOTORS**

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

*Precision-built industrial motors since 1915*

# *Converting* HORSE POWER *to* "FIRE POWER"

10
SIZES:
30", 36"
42", 52"
62", 72"
84", 100"
120"
144"



Wide Variety of Head Combinations, with or without Side Head

KING
36" HEAVY DUTY
VERTICAL BORING &
TURNING MACHINE

ON
DEFENSE
PRODUCTION

# *The* KING *Way*

American Steel Foundries

**KING MACHINE TOOL DIVISION**
CINCINNATI 29, OHIO

# SPOT NEWS of Metalworking

- **Flow of maintenance, repair and operating supplies to foreign users** is being simplified and speeded up. NPA has been granting DO-97 rating to qualified exports of MRO supplies. It intends to delegate this authority to Office of International Trade, which also screens applications.

- **Another sharp reduction in amount of tungsten for defense production** is coming, NPA warns. Tungsten has been at top of critical-shortage list for several months. It will be still harder to get in July and August, and there is no relief in sight.

- **Manufacturer of silent chains has new-type chain about ready to introduce** to automotive engine manufacturers. It is so designed that it goes onto the toothed pulleys or wheels tangentially. The chain is stiffened so centrifugal forces at higher speeds will not put a bump in chain just before it engages pulley teeth. Claim is that life of chain will be doubled.

---

Allis-Chalmers will erect a new plant to cost $5 million at Terre Haute, Ind., to make compressors for the new Wright J65 Sapphire turbojet engine. This is the largest subcontract awarded by Curtiss-Wright in its Sapphire production program.

---

- **A large automotive manufacturer has installed a new graphic recorder** for inspecting hypoid rear axle gears. In a matter of hours engineers found errors they had been making for years and were able to correct them. The special machine, a "Probograph," made by Industrial Scientific Co., employs three probes working in three planes to trace tooth contours.

- **UAW-CIO claims to have obtained for its members economic benefits** costing about 80 cents an hour since the war. The hourly-rate increase is fixed at 59 cents, broken down as follows: 1946, 18½ cents; 1947, 11½ cents; 1948, 13 cents; 1949-50, 11 cents, and 1951, 5 cents. Other economic gains, valued by the union at 21 cents an hour: hospitalization, insurance, pensions, paid holidays, improved vacations, higher shift premiums, and wage increases for special groups of workers.

- **Labor insiders say President Truman has promised that the administration** will not upset existing wage contracts. So, unless Congress intervenes, you can expect wage control rules to allow increases under existing union contracts whether or not they pierce ceiling.

- **NPA will get tough about inventory ceilings soon as CMP goes into effect July 1.** They'll check inventory reports against estimated production as reported in allotment application forms. If they find inventories exceed ceilings—45 days' supply for steel, 60 days' for copper and aluminum—they'll trim back allotment requests accordingly. So producers with excessive inventories will have to produce out of them until they come into line.

---

Milk-bottle-sized auxiliary power package for guided missiles, with a tiny 60,000 rpm axial flow turbine, has been developed by AiResearch Corp., Los Angeles. As a second power source within a missile, the auxiliary unit will operate such elements as stabilizers, air surface and guidance controls during supersonic flight.

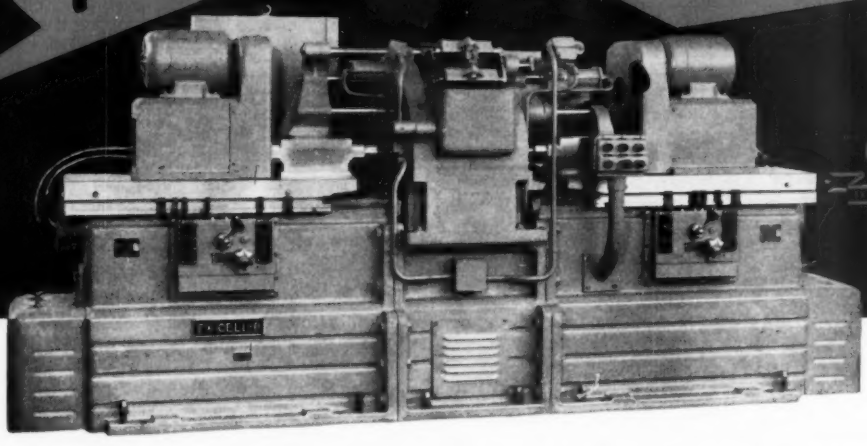
---

- **Canadian decision to switch to U. S. Garand rifle** from British Lee Enfield has been accentuated by British action in going over to .23-calibre Belgian-type rifle which is lighter in weight than either Garand or Lee Enfield. British will be cut off hereafter from North American sources of supply. British idea is to save metal, manpower and expense.

- **Countersinking of 15,000 close-tolerance holes in the wing of each B-47** has been made easier by a portable, self-attaching, air-motor-driven countersink tool invented by Boeing tool designers. Each hole formerly required 3½ min and the work was so difficult that men had to be alternated frequently. The new tool does the job in 30 to 40 sec with a reduction of 90% in manhour costs.

- **The centrifugal force effect common to rapidly moving steel chain** will be used by a manufacturer of automatic clutches as a means of load pickup.

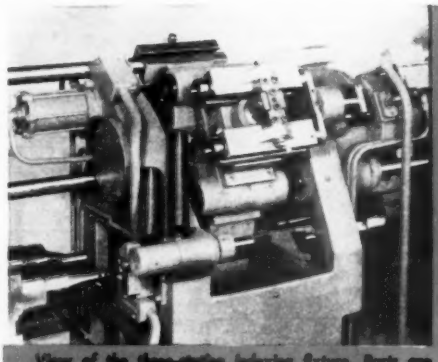
# DOUBLE ACTION FOR DOUBLE PRODUCTION




## EX-CELL-O TWO-WAY MACHINE BORES, CHAMFERS, AND FACES BOTH ENDS OF TUBULAR STEEL PARTS AT NET RATE OF 366 PIECES PER HOUR!

Ex-Cell-O Way Type Precision Boring Machines save time by machining parts from two or more directions at the same time. And relationship of the various operations to one another is exact because the accuracy is built into the machine—it does not depend on the accuracy of repeated locating and clamping.

The machine illustrated here has a trunnion type indexing fixture, machines both ends of two parts per cycle, ejects the finished work automatically. Have your Ex-Cell-O representative explain all the advantages of these machines to you, or write today to Ex-Cell-O in Detroit for further information.



*View of the three-station indexing fixture. Parts are loaded in upper station, machined in lower station, automatically unclamped and ejected from rear station.*

**EX-CELL-O CORPORATION** DETROIT 32 MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

# Washington

**Will the new CMP work? Top mobilizers are convinced open-end controlled materials plan will spread available metals far as possible among users. But they fear businessmen, especially smaller metals fabricators, will snarl this effort.**

• • •

**Signs of an attack on new CMP program** already are showing up—even though the plan doesn't go into effect until July 1. All kinds of producers are clamoring for allocations. Under CMP, only suppliers of the military and essential civilian programs are slated for allocations. Small producers of consumer durables complain most. They're skeptical of the controllers' promise that there will be lots of metal for them after military and essential civilian production get their cut.

**Protests won't change CMP plans**—not for the quarter starting July 1, at least. The controllers couldn't switch signals that fast, even if they wanted to. And complaints aren't that serious —yet. Look for new allocations for October, however, or for the first quarter of 1952 at latest. Pressure on controllers will be too great to resist by then. Only all-out war can stem it.

• • •

**Real danger to CMP is attitude of Congress** after it hears businessmen complain. Congress already is sniffing suspiciously at all controls. You can see that in the fight brewing on extension of defense Production Act. It will go on and on.

**The debate will add to pressure on controllers.** It's hard to say no to a Congressman about to vote on legislation that will keep your agency in operation. And Congressmen are especially sensitive to small businessmen's appeals.

• • •

**Congress will vote to continue controls in the end,** though it may have to pass stop-gap extension. Present law expires June 30, and there is almost no chance the debate will be over then. The controllers will get few of the new powers they are asking for.

**Two changes likely to go through:**

**Subsidies for metals production,** wanted especially for copper, lead, zinc.

**Government buying of any scarce materials,** instead of just raw materials under present law.

• • •

**Until Congress acts on Defense Production Act** amendments, wage controls will be flexible enough to allow (1) wages to rise with the cost of living and (2) the annual improvement increase due June 1 at General Motors and other auto plants.

• • •

**Cost of pensions and health and welfare plans** will be exempt from the 10% (or higher) cost of living ceiling. But they will still be under control. Limits which will be approved are being drafted.

**It looks like a 7-cent hourly increase in June** for General Motors and other employees covered by UAW-CIO wage escalators. The cost-of-living index will call for a 3-cent increase, unless the index goes down this month. The four-cent annual improvement increase will also be due.

• • •

**There is more to the Ferro Stamping Co.** decision than meets the eye. True, NLRB ordered UAW-CIO to refund discriminatory initiation fee charged employees who had refused to join the union until after a union shop had been won. But it also permits unions to declare a future increase to induce workers to join.

• • •

**Organized labor won considerable gains** by its boycott of defense agencies: the advisory board to President Truman (short-circuiting Wilson); disputes-handling by WSB; labor-management committee at the Wilson level, and labor leaders as assistants to Wilson, Johnston, DiSalle and Fleischman.

**But the United Labor Policy Committee** will not admit it is satisfied. Labor's pressure will now shift from the White House to Capitol Hill. Labor leaders want tighter price controls, tax concessions for workers.

• • •

**You can take that NPA job for six months now,** then go back to your company for the "duration." That's basis on which top business men are filling the 40-50 key jobs—at bureau and vision chief levels—in the agency.

**They're forming a pool of businessmen-controllers.** They won't be called again soon, short of all-out war, but theoretically will be available for the next emergency. NPA would like to have you stay longer, but figures you can get the pitch on controls and government in six months.

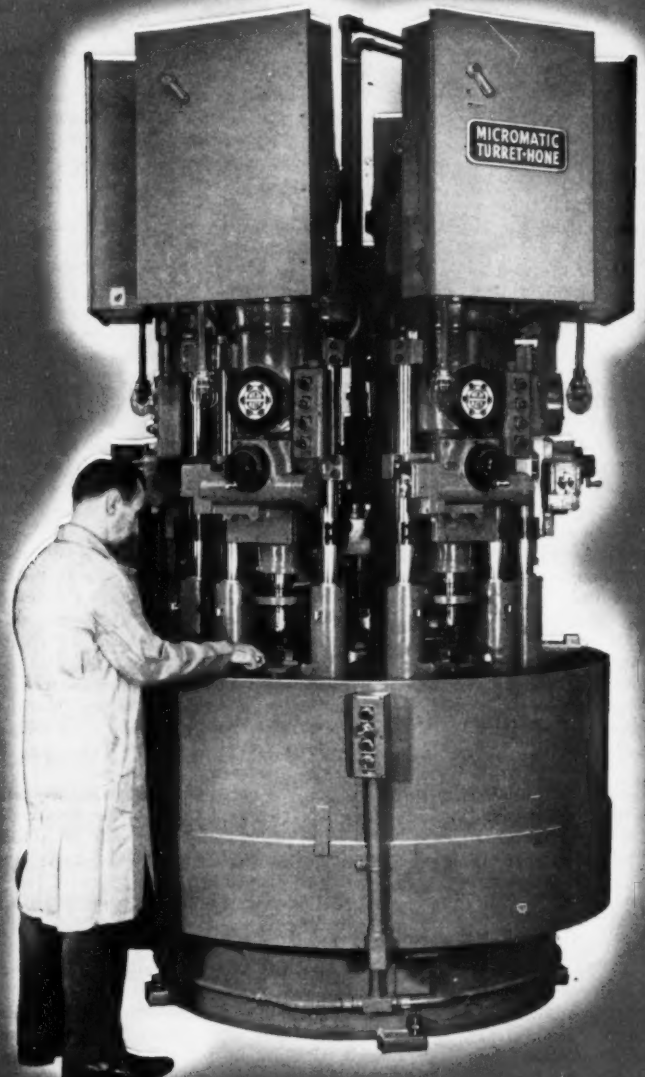
• • •

**Army will spend another $900 million for ordnance** before July 1. It's in new supplemental appropriation bill now before Congress. Major items: artillery ammunition, $45 million; small arms ammunition, $18 million; medium tanks and gun carriages, $350 million; guided missiles, $137 million.

• • •

**A crackdown on delinquent military contractors** is in the works. It's result of recent study which showed sharp increase in failures to meet contract delivery dates.

# NEW *High Production + High Precision* TURRET • HONE

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THIS new model 736-6 TURRET-HONE finishes a part every five seconds. The operator unloads and loads the fixtures as they pass the control station. As the loaded fixture leaves the control station it automatically lifts into position, the tool starts rotating, reciprocating and expanding. The machine rotates continuously. When the part is "to size" the automatic MICRO-SIZE control stops the tool and drops the fixture. As the fixture passes the operator again, a new part is loaded and the cycle continues. This is repeated on each unit.

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# Detroit

**Allocations or no, automobile production** continues to maintain itself on high ground. The level for late April and early May held around 160,000 cars and trucks a week, U. S. and Canadian plants included.

**Chrysler hopes to build as many jobs in May** as it did in April. General Motors likewise has scheduled daily operations on a sustained and unchanged basis. Ford, ditto.

**Hudson has reduced output for May**, charging it to parts and materials shortages. Kaiser-Frazer, its output backed up somewhat from dealer showrooms, has also reduced. Studebaker and Packard are somewhat down. Nash is firm.

• • •

**Automobile production cutbacks** during this second quarter are on a selective basis geographically. The big push for output continues in the Detroit area operations; the outlying facilities are being throttled back. Along the Atlantic seaboard, for example, branch plants will reduce as much as a third of their operations this quarter, as compared to the same 1950 quarter. The scattered few plants in the wheat belt will cut back 15% or 20%. Pacific coast plants will be down from 20% to 25%. Headquarters plant operations, meanwhile, will advance a fourth or so. The idea: Concentrate output where it can be most efficiently handled.

• • •

**Tool-shop employment in Detroit holds** rather steady. The compilation of 117 typical shops in April showed employment up very modestly, continuing the trend which first began to evidence itself 16 or 18 months ago. Of the 117 shops, six increased employment, three reduced; the net effect was an over-all gain of about 1%.

• • •

**Delivery promises continue** about as they have been fractionally a little quicker. Jigs and fixtures are available generally within five weeks, gages in about three weeks, machine metal dies in about five weeks, and forging dies in six weeks. A year ago, for comparison, this same tooling was available in four weeks, two and a half weeks, four weeks, and six weeks respectively.

**The near-term outlook:** Modest reduction in order banks. Programs for 1952 models (mainly on sheet metal) are about all placed. The incoming military business is good, but does not yet seem sufficient to take up slack as car tooling starts to clean up.

• • •

**High-compression engines** can produce their gasoline octane requirements if they are designed with the latest developments. "Mechanical octanes" built into them can reduce the range five or six numbers. That conclusion is evident from the latest General Motors experimental engine, a much-advanced modification of the Kettering powerplant unveiled in 1947.

**First revealed at a petroleum industry meeting** in early May, the new GM engine uses 100 octane gas plus additives, but is understood to have run on fuel three or four numbers lower. GM was coy about telling how. But the answers seemed to lie in spark adjustment, cylinder-hemisphere shape, other attributes.

**The engine is quite a way from production** — even 96-97 octane gas isn't generally near by. But it's foreseeable. The brilliantly conceived prototype wasn't—it was strictly a laboratory job.

• • •

**Automatic-transmission manufacture** will continue to expand—even though the near-term outlook may be problemsome. Fabricast Division of General Motors, which makes permanent molds, mostly for torque converter transmissions, will build a new aluminum-casting plant at Jones Mills, Ark., with about 100,000 ft of space. About 1000 will be employed.

• • •

**Expansion is also in order** at the Newcastle (Ind.) plant of Chrysler Corp., operated by Dodge for manufacture of parts for all corporation cars and trucks. A 400,000-ft forging press shop addition is being built and a 15,000-ft addition is going onto the die shop. The press shop will be equipped with four 2000-ton forge presses, four 160-ton trim presses, and other facilities. This plant, incidentally, is equipped with about 2700 machine tools to make 154 separate parts.

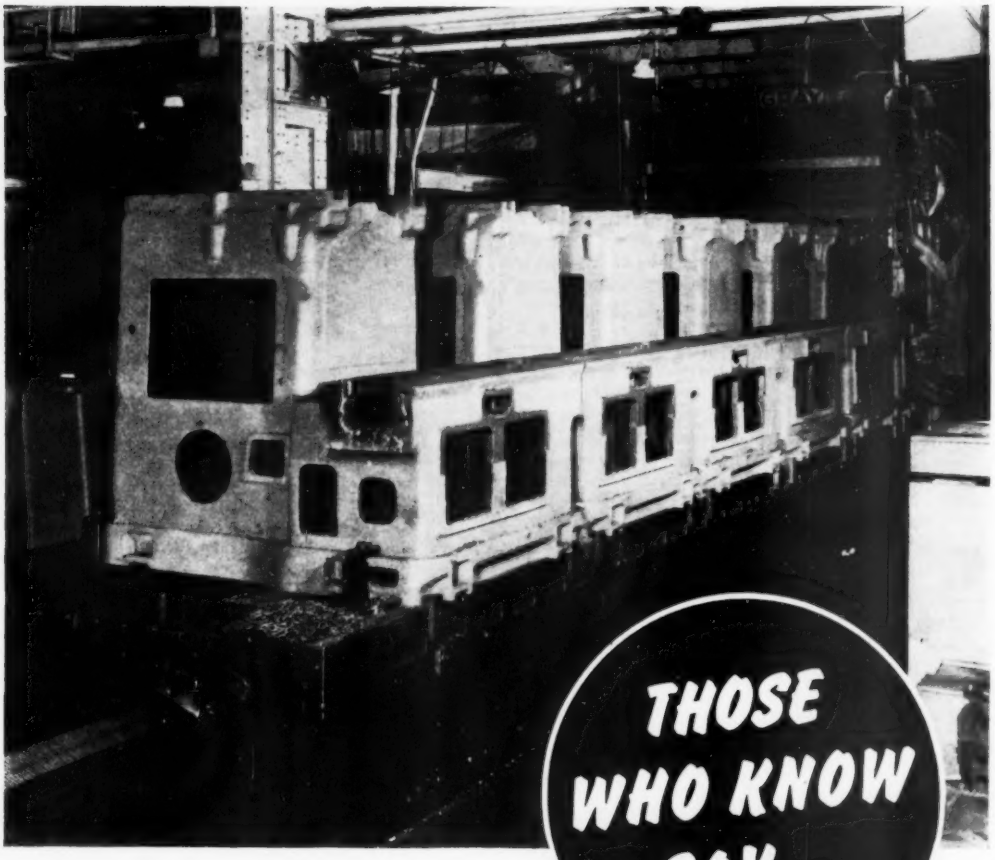
• • •

**Buick's jet-engine plant** will be located near Willow Springs, Ill., about eight miles southwest of the Chicago Municipal Airport. It will contain about 1,000,000 sq ft of floor space on one floor. Parts for the engine will be made in Flint and shipped to Chicago for final assembly.

• • •

**Scrappage rates on old cars have tumbled** from prewar levels. Recent figures show that between 1940 and 1941, about 34% of cars aged 12 years or more were scrapped; between 1949 and 1950, the rate dropped in half—to 17%. With auto output in jeopardy, the low scrappage rate—normally an indicator of replacement market size — presents no problem, though it would usually signal lower new-car demand.

**The big factor in making motorists hang onto** old cars longer is the low trade-in value on ancient jalopies. The absence of "middle-age" cars, arising from non-production during four war years, also adds weight: The old-car owner now has to jump all the way up to high-priced late model if his rattler fails him. Result: He hangs onto it.

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# Machine Tools

**April was another banner month** for machine tool orders, builders declared at the spring meeting of the National Machine Tool Builders' Association. Inquiries indicate that the flood of defense business will continue to pour in.

**March, at 591.8 on the NMTBA index,** was not much below the February peak of 615.5 (with average shipments in 1945-1947 taken as 100).

**Foreign bookings moved up** substantially in March. They reflected added British business.

• • •

**Shipments of machine tools rose** encouragingly in March. They were 158.8, as against 123.8 in February. Defense officials would like to see the production rate doubled by the end of '51.

**This year machine tool output** will be around 56,400 units, less than one-third the number (185,000) produced in 1941. When Korea began, operations were down to 34,600 machines a year.

**The industry** currently is shipping at a rate of about $540 million a year.

• • •

**James Blackshaw, assistant secretary** of British Ministry of Supply, arrived by air in New York on May 7 and went immediately to Washington to confer with defense officials on expediting deliveries of U. S. machine tools for the British defense program. He was accompanied by A. J. M. Baker of U. S. Economic Mission located in London.

**The British now have on order** in this country some 8200 machine tools, though a large number do not have delivery dates and are not regarded as firm. About 5000 have DO's.

• • •

**A formula has been worked out** for pool orders to be awarded makers of special machine tools and presses. Example: pool orders will be given for standard subassemblies, such as drilling heads, which are mounted on various types of bases with various kinds of tables, jigs and fixtures for different jobs.

**This decision is academic** at the moment, because no money is available for more pool orders at this time. Eventually, however, about 75% of machine tool builders are expected to get pool contracts.

• • •

**NPA officials told** packaging machinery makers of opportunities to convert to machine tool production, at a meeting of the industry's advisory committee on April 24.

**Pulp and paper machinery companies** told NPA on April 23 that they did not want to make unrelated items such as machine tools. They said, however, that they would shift into defense work if the defense program so requires.

**Used general-purpose machine tools** of recent manufacture have all but disappeared from the market, unless at very high prices, according to a report made at the meeting of the Second-Hand Tool Rebuilders and Resellers Industry Advisory Committee with NPA on April 23.

**Backlog of orders for rebuilding machines** ranges from two to six or seven months. Possibility of expanding rebuilding facilities is slight, mainly because of the manpower shortage.

**Most dealers** who could do considerable rebuilding are in areas in which much defense work is being done and in which skilled mechanics are impossible to get.

**There is no provision** now for replacing worn parts on machines which dealers have in stock and which are not sold on DO priorities. Sale of incomplete machines thus becomes impossible.

• • •

**Ceiling price formula on used machine tools** is expected to be ready soon. Charles Simmons, advisor to OPS, stated that prices will be based on a fixed percentage with relation to new machines.

**Mr. Simmons, who is president** of Simmons Machine Tool Corp., has recommended that the ceiling be 65% for "as is" machines in the age group between 1940 and 1950, and 90% for rebuilt machines. Those machines manufactured between 1930 and 1940 would have a ceiling of 55% in "as is" condition and 85% rebuilt.

**Task force for the used machine tool group** consists of: Harvey H. Goldman, Harvey Goldman & Co., Detroit; George E. Merryweather, Motch & Merryweather Machinery Co., Cleveland; and Myron M. Segal, Acme Equipment Co., Inc., Chicago.

**Machinery price order (CPR-30)** eases the situation for machine tool builders, but does not solve their price problems satisfactorily.

**Hence a task force of builders** met in Washington with OPS officials on May 8 to discuss terms of a new price order to apply to machine tools only. Until such order is issued, expansion of machine tool subcontracting is likely to be delayed.

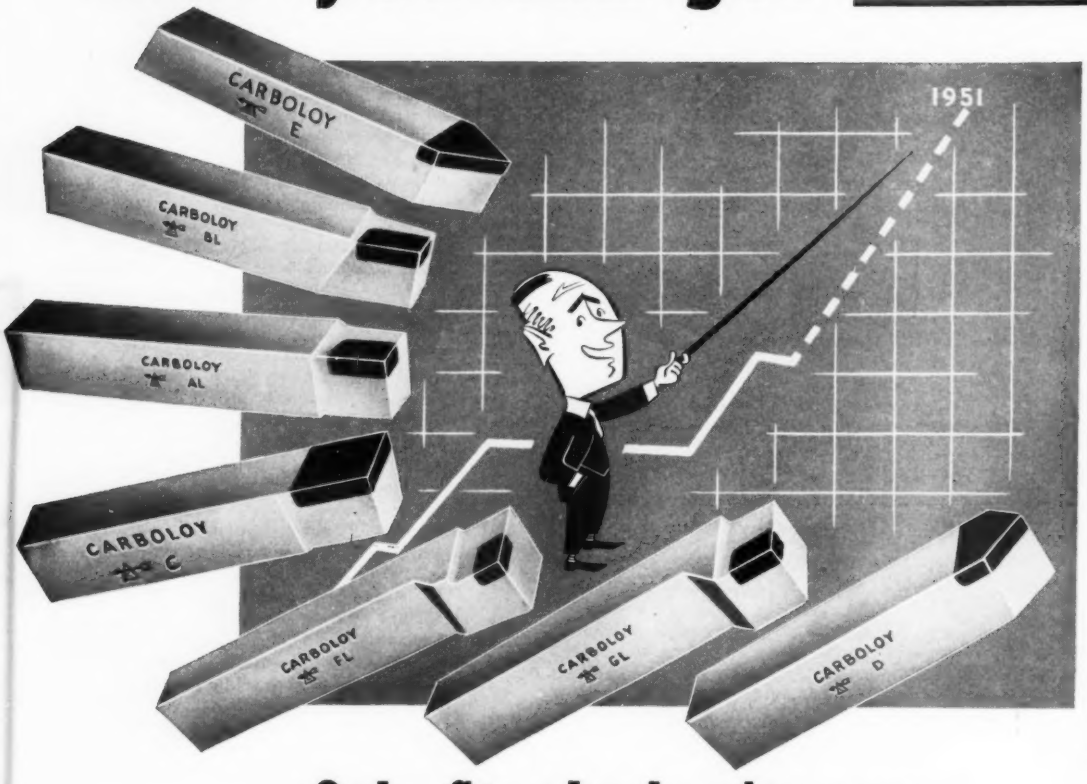
• • •

**No machine tools have yet been bought** for at least four jet engine programs. Those programs will add up to several hundred million dollars. The fact is that the bulk of machine tools for defense tooling has not yet been bought.

• • •

**Automobile makers** still are dangling orders for new motor car tooling in front of machine tool builders. What's more, they are putting on pressure to have them accepted and the machines built.

# How you can get even

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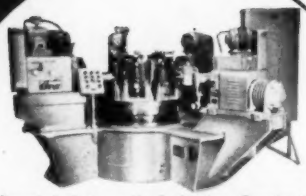

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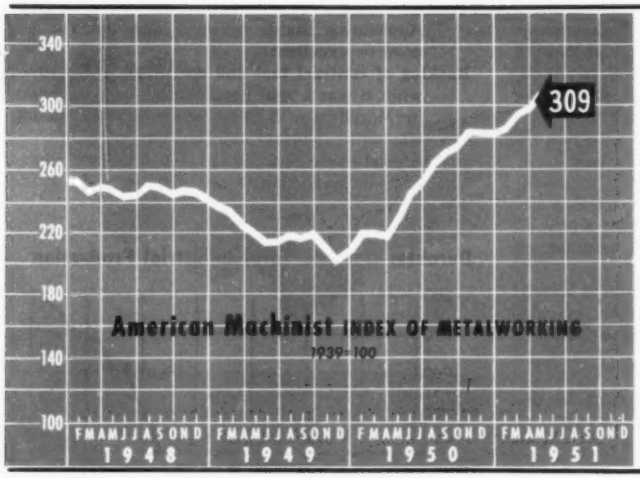
WRITE FOR ENGINEERING CATALOG NUMBER 51

# Gaging Metalworking




## INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

| | APR. '51 | MAR. '51(p) | FEB. '51(r) | MAR. '50 |
|---|---|---|---|---|
| | **309*** | **301** | **297** | **220** |
| Machinery | | 294 | 293 | 213 |
| Electrical Manufacturing | | 336 | 333 | 258 |
| Automobiles, Trucks | | 257 | 256 | 195 |
| Transportation Equipment | | 351 | 343 | 210 |
| Other Metalworking | | 307 | 299 | 242 |

* Estimated (p) Preliminary (r) Revised

# Shortages Fail to Stop Flood of Products

**Metalworking industries still are pouring out** products at an astounding rate, despite materials shortages and NPA cutbacks.

**Manhours worked are at a postwar peak.** They are not likely to go much higher the next few months. But neither will they fall off much if any.

**Almost all durable goods manufacturers** are choked with huge backlogs which will keep them running full as long as they can get materials and men.

**The desire of most companies to turn out** just as much volume as they can before materials restrictions are imposed, has kept production of consumer goods at record heights. And in many lines output has greatly exceeded sales, with heavy inventories resulting. But manufacturers are not worried. Surveys show that people will be buying this year about the same total of goods of all kinds as in record 1950.

• • •

**Motor car makers will come close** to setting new high in the first half of '51. And Washington is believed to be looking kindly upon introduction of new 1952 models in the last half of the year.

**Washington would hardly give such an okay** unless it were prepared to allow a pretty high rate of automobile assemblies. Certain top defense officials have said that at no time in the rearmament program do they expect car output to dip below 50% of the volume turned out in the first half of 1950.

• • •

**Important makers of heavy appliances** say that their production rates won't be affected much the next month. They are off only a little from the first quarter's whopping figure.

**Conflicting reports come from farm implement** people. They seem to be hit more than some other industries by materials shortages. But they are still doing all right by pre-boom standards.

• • •

**A whole flock of components parts makers** are pushing production hard to try to keep up with orders. Examples: Electric motor companies, bearing manufacturers.

**Materials-handling equipment builders** have all the work they can do for months ahead. Shipments in several materials-handling categories—industrial trucks is one—will be double the 1950 rate this year.

• • •

**Railroad car builders** have managed to boost operations sharply. Pullman-Standard, for example, was up in April to 2700 cars.

**Diesel-locomotive makers** are running almost round the clock with huge backlogs to draw on.

• • •

**Amount of "conversion" unemployment** is very low. Point is that if a man is laid off because a factory is short of materials, he can go across the street and get another job.

**Whether the timetable on armament production** can be met is a neat question. Our guess: many of the programs will be delayed because plants cannot be tooled up as fast as the armed services would like. The programs were unrealistic to begin with.

# Gaging Business

**Industrial output in March reached the highest point** in six years (222 compared with 1935-1939 = 100). Little change is expected in April. However, the index of industrial output has gained only 3% in the past six months.

• • •

**Between February and March, nonfarm employees** rose about 400,000. This gain reflects seasonal upturns in construction and retail trade. Continued employment gains in aircraft and machinery plants pushed the total number of manufacturing workers up.

**The factory workweek averaged 41.1 hours** in March. In machinery plants, however, the average workweek was 44 hours, the highest among manufacturing industries.

• • •

**Industrial prices have declined about 0.3%** in the last month. Since Korea they are up 16%. On the other hand, consumers' prices continue to rise—though slowly. Currently, the cost of living idex is nearly 9% above pre-Korea prices. Since price freeze it has risen at the rate of about 0.2% per month.

• • •

**Inventories are building up in many lines.** Foremost among these is television. Rumors in the television industry put the number of sets on hand close to the 2 million mark.

**The increasing rate of war plant expansion** is expected to cause a real squeeze on production of civilian consumer goods. This is not Mobilizer Wilson's plan, so some cutback of plant expansion program is now expected.

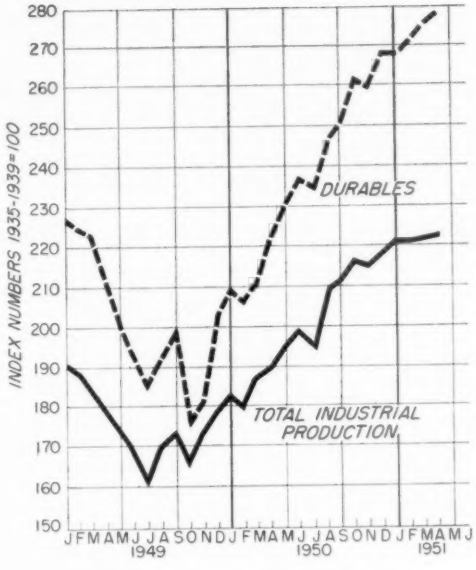
• • •

**Current boom in tool and die business** is proved by this fact: for first time in years every shop reporting to National Tool & Die Manufacturers Association states business and outlook are good or excellent.

**Backlog of contract tool and die shops** is 2½ times what it was a year ago. Volume of new orders in March was highest since the association started to tabulate monthly figures.

**Higher production** of tools and dies is coming mostly from longer hours, not more men.

## Durables Outpace Total Industrial Production




## WEEKLY BUSINESS INDICATORS

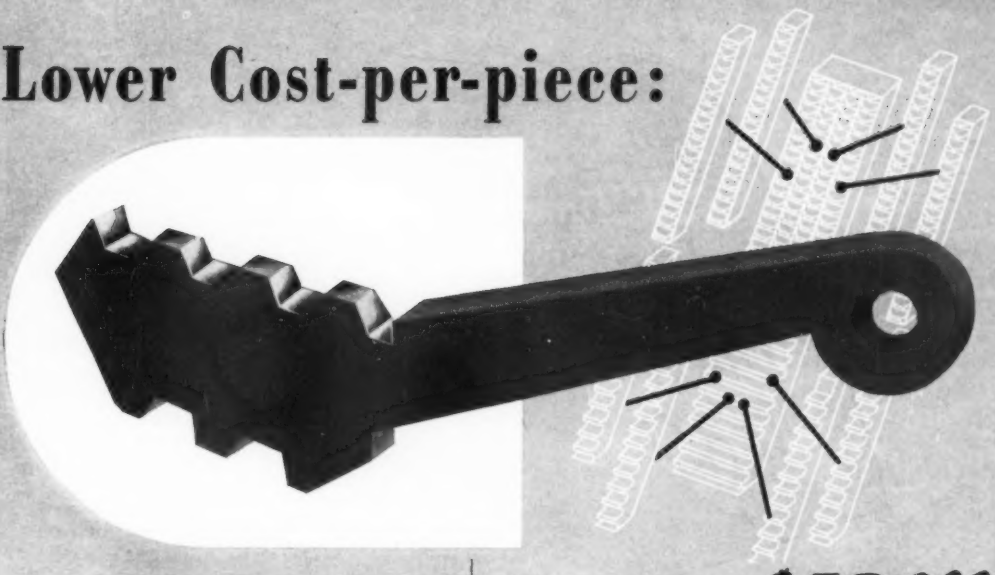
| | Latest Week | Preceding Week | Year Ago |
|---|---|---|---|
| Business Week Index of Activity (1923-1925 = 100)* | 236.0 | 235.0 | 206.5 |
| Steel ingot production (thousand tons) | 2,079 | 2,065 | 1,910 |
| Electric power output (million kilowatt hours) | 6,674 | 6,730 | 5,902 |
| Production of automobiles and trucks | 163,883 | 166,502 | 148,274 |
| Engineering construction awards (Eng. News-Record—millions) | $270.5 | $284.7 | $250.6 |

## MONTHLY BUSINESS INDICATORS

| | Latest Month | Preceding Month | Year Ago |
|---|---|---|---|
| Refrigerators, domestic sales (thousands of units) | 591 | 423 | 586 |
| Vacuum cleaners sales (thousands of units) | 290 | 287 | 361 |
| Washers sales (thousands of units) | 368 | 341 | 424 |
| Household electric ranges sales (thousands of units) | 162 | 124 | 144 |
| Television receivers production (thousands of units) | 869 | 679 | 687 |
| Radio receivers AM and AM-FM production (thousands of units) | 1,738 | 1,313 | 687 |
| Gear sales index (1935-1939 = 100) | 830.7 | 809.1 | 358.4 |
| Foundry equipment new orders index (shipments 1937-1939 = 100) | 599.0 | 638.6 | 225.2 |

* Seasonally adjusted.

# Lower Cost-per-piece:



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The original tooling to produce the forms on the above part incorporated each contour in a solid broach. Detroit Broach engineers recommended "breaking up" each form into individual inserts as well as rough and finish sections. The result was an immediate saving of $530.00 per set of tools. While the rate of production remained the same, the smaller size and simplified form of each insert made tool sharpening costs drop substantially. Further, if some part of the form was damaged, only one insert, either "rougher" or "finisher"—not an entire form broach—needed replacement.

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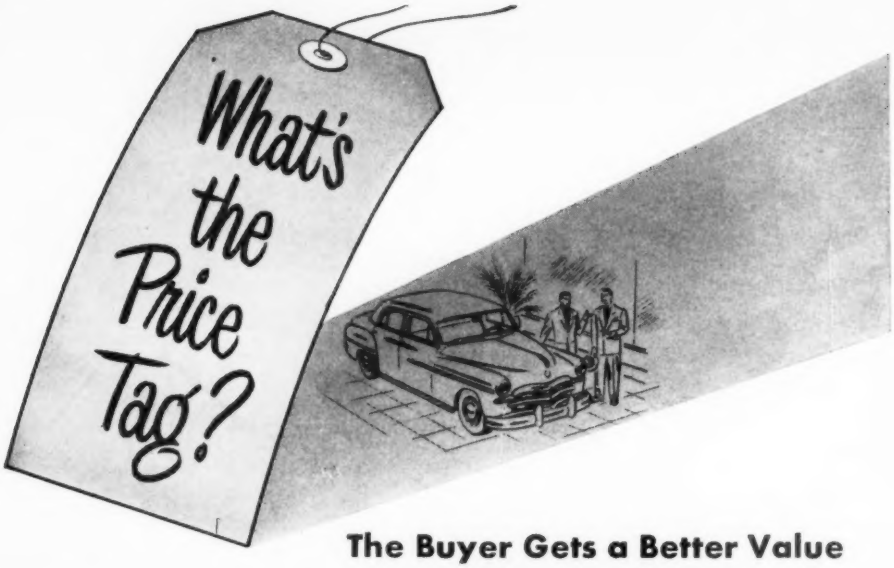
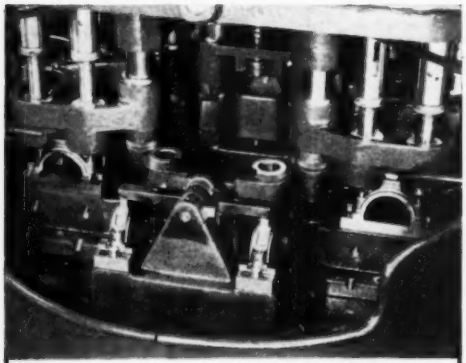



## The Buyer Gets a Better Value ...with an assist by MORRIS ENGINEERED PRODUCTION



Hand-clamped in pairs, forged steel (SAE 1041) connecting rod caps are rough spot faced, finished spot faced and countersunk (a total of twelve operations on the two parts) at a rate of one part every 8 seconds!

Automotive Connecting Rod Cap—Two Views.

In the auto plant or in the showroom . . . it's an American trait to want quality at a price. The manufacturer gets it in a MORRIS Engineered Production Machine . . . for a better product at less cost . . . and passes it on to the buyer in a mass produced car.

MORRIS Production Machines cut time and costs wherever multiple drilling, reaming, tapping, boring or similar operations are performed. In addition, a major plus feature is offered, namely, all machines are built from *standard units* to do a *special job* . . . a real savings in initial costs.

Just mention your specific problem. Chances are, in our forty years, we've handled a similar problem and can show you cost-saving facts and figures.

Drilling of MOR-SPEED Line

THE MORRIS MACHINE TOOL COMPANY

933 HARRIET STREET CINCINNATI 3, OHIO

***"A better product at less cost — with MORRIS ENGINEERED PRODUCTION."***

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

# How Will You Make Out?

Recent pronouncements from Washington make clear what is going to happen in Metalworking.

First of all, $50 billion a year will be spent for three years on military goods. Orders for munitions, which have run over $1 billion a week since January 1, will be translated into a substantial volume of end-items by next December.

Next year will be a year of continuing accumulations of these military products. Much the same situation will exist in 1953.

BUT THAT ISN'T ALL. Meanwhile we will be tooling enough new plants, many of which will be for standby purposes, to take care of all our requirements in case of an all-out conflict.

What's more, we will build reserve stocks of key military items sufficient for the first year of a full-scale war. And we will stockpile scarce and critical materials.

Beyond that, we will add impressively to our raw-materials facilities. Before 1953 is out, we will have enough raw materials to be able to turn out armament at a $50-billion-a-year rate and, at the same time, manufacture civilian goods at 1950's record-breaking pace.

It is an astonishingly bold plan, one which contemplates superimposing a huge munitions program on top of a normal civilian economy. For a while, the maker of non-essential products will be pinched. But not for long. He can look ahead to resumption of big operations within two years.

THIS PROGRAM CANNOT do other than astound the rest of the world, both Stalin and our allies. No other nation would dare attempt it. And we would not dare attempt it if we did not have the mechanical help that fast-producing machines have given us.

How individual metalworking companies will fit into this program is essentially a problem for each management to work out. One thing is sure. Management will have to be fast on its feet. For the situation is likely to shift from week to week and from month to month.

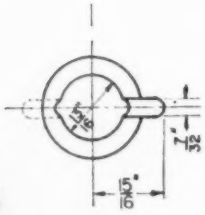
It will not be a time for nervous indecision. Those who dawdle will be left out. Meanwhile the bold planners will have gotten the business.

It will be a time when manpower, materials and machines should be used most efficiently; when redesign of products and substitution of materials will be more important than ever for the long pull as well as the short haul; when costs should be trimmed to keep prices within reasonable bounds; when increased productivity as a key factor will take on new meaning.

IT WILL BE a time when the skill of management will get a real test.

Burnham Finney

# IT'S A full-time SHAPER...




PHOTOS—COURTESY THE OHIO KNIFE CO., CINCINNATI, OHIO

**PRODUCTION**

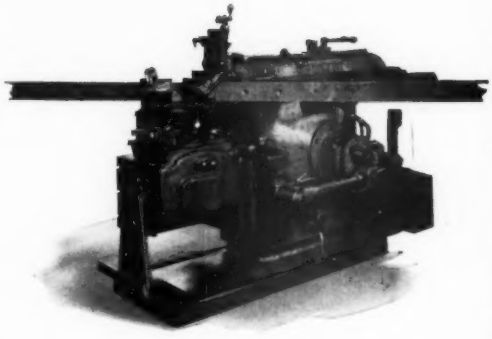
Working two shifts, full time, this Cincinnati Shaper notches fourteen plow-bolt holes in these shear knives every five minutes.

Shapers at The Ohio Knife Company are used strictly as manufacturing tools, for mitering, contour cutting, slotting, corrugating and beveling knife blades.

**COSTS**

The setups for all these operations are simple, rapid and inexpensive—and a low manufacturing cost results.

Write for Shaper Catalog N-3. It will help you determine the size and type of Cincinnati Shaper you need.



Knives are high carbon, high chrome steel. Cutting tool is high-speed steel. Shaper operates at 119 strokes per minute.

## THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

"To step up inventory turnover, we installed...

**Production-control machine** is a major feature of a new system of material control at Dayton Pump & Mfg. Co. All entries on master-control card are made by machine, which actually is a standard electric posting machine built by National Cash Register Co. and applied to production-control functions

# ...MODERN PRODUCTION-CONTROL METHODS

**Our new system employs fast, machine-made computations, eases the load on personnel, and tightens control over production and inventories"**

BY LOUIS WOZAR, Vice President & Associate General Manager
and CHARLES RIKE, Production Manager
DAYTON PUMP & MANUFACTURING CO., Dayton 1, Ohio

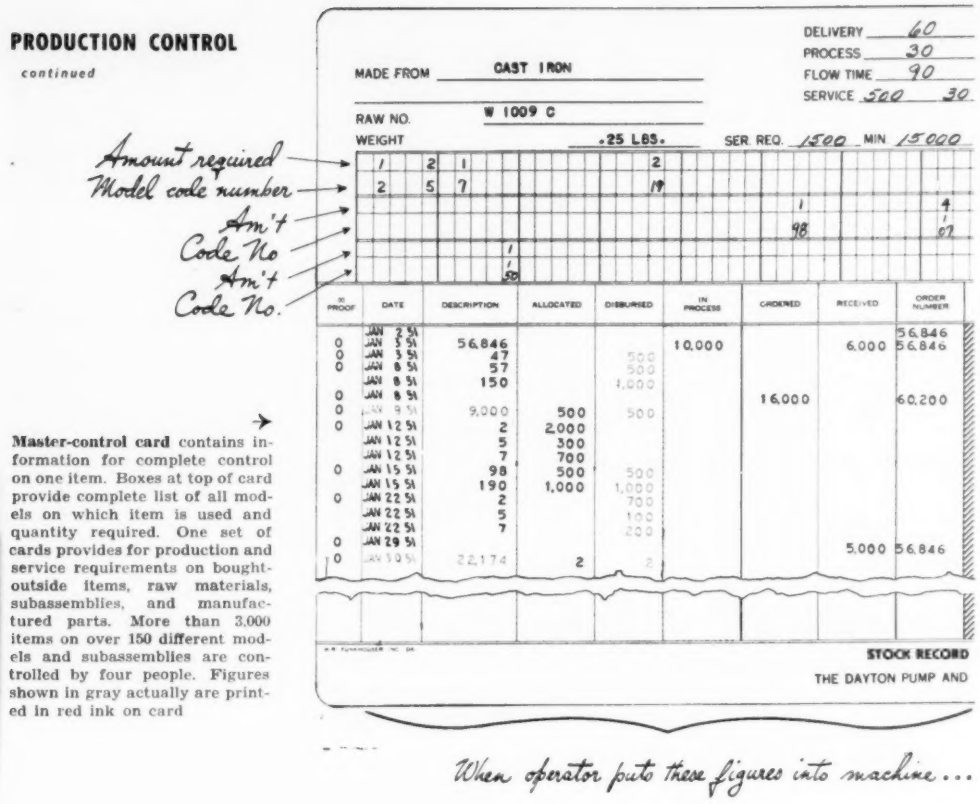
In our new material- and service-control system, slow manual posting has been replaced by rapid machine operations. This eliminates the lag between the receipt and recording of figures and provides accurate, up-to-date information upon which management decisions can be based. In a matter of minutes, the complete status of any item in the plant can be determined. As a result, much closer control over material is possible, with resultant lower inventories and greater inventory turnover.

At the heart of the new system is a National class 31 electric posting machine and a *master control card* that was specifically designed for use on the machine. On this card are all data required for complete control over one item of material. Recorded information includes individual order balances for total on order, total allocated, total in stock, and total in process. These balances are automatically computed and automatically printed by the posting machine. Absolute accuracy is obtained, for the machine mechanically proves the previous balances entered by the operator. Any error in entering the previous balances is indicated in the proof column. Both production and service requirements are covered by the new system and the one set of file cards gives complete material control for the plant.

Actually three cards are employed: yellow for subassemblies, salmon for bought-outside items, and green for manufactured parts. These differ only slightly: for example, the card for purchased items obviously requires no column for "in-process" figures. Their major features, however, are the same.

Near the top of the card is a group of small boxes. In these are marked the code numbers used for the different models for which the part is required together with the number of pieces required per model. As our line contains over 98 different models of pump and home water softeners plus 58 different accessories, parts are designed for assembly in more than one model wherever possible. Even so, there are more than 3000 different items that must be controlled.

On the new card, sufficient space has been provided so a part or subassembly required in as many as 200 different models, could have the code number of every model listed at the head of the form. In this way, we know at a glance, exactly where and in what quantities each part or subassembly is used. The quantity




**Master-control card** contains information for complete control on one item. Boxes at top of card provide complete list of all models on which item is used and quantity required. One set of cards provides for production and service requirements on bought-outside items, raw materials, subassemblies, and manufactured parts. More than 3,000 items on over 150 different models and subassemblies are controlled by four people. Figures shown in gray actually are printed in red ink on card

per model, multiplied by the production schedule per model, plus service requirements, gives a total monthly requirements for each part or subassembly. This total in relation to delivery time, or material and in-process time in the shop, enables us to set up minimum and maximum on each card for ordering. This feature will serve to reduce the size of inventory that we must carry.

In our old system, everything was set up on the basis of a model. It was necessary to review all of our 98 models of pumps and home water softeners, plus the 58 accessories each month, for the ordering of material. This threw a terrific work load on the Production- and Material-Control Department at the start of each month, and inevitably work fell behind and figures were not up-to-date. At the same time, to keep inventory balanced, we had to maintain supplies on all items equal to those needed for the items on which deliveries were the poorest.

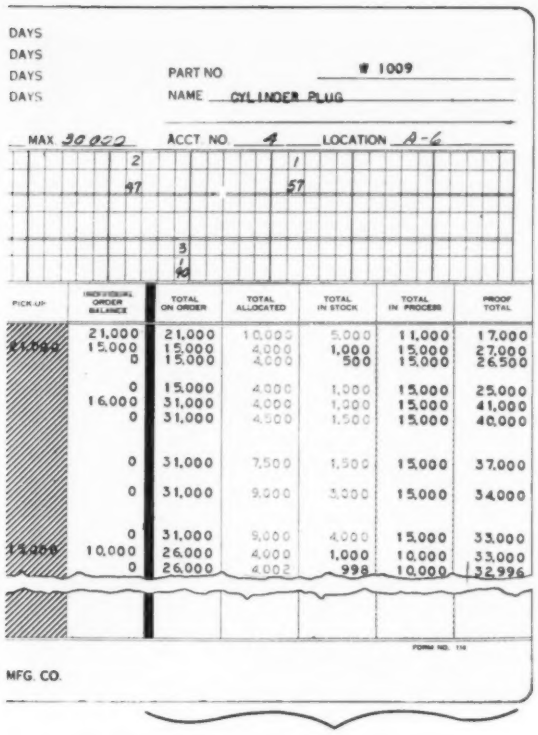
Now, with all information on one card and with minimum-quantity ordering points, orders will be placed whenever the minimum is reached. Monthly work pileups are eliminated and inventories related closely to market conditions.

### *All Information Is on Card*

In addition to complete identification of the item, the heading of the card contains essential inventory-planning information. For example, at the top center of the card under the heading, *Delivery*, is shown the time needed by the vendor to produce and deliver the raw castings. Under *Process* is listed the time for our factory to process the part complete. *Flow* is the sum of delivery and process time. *Service* gives us the requirements of that department for a 30-day period. *Minimum* and *Maximum* list are the ordering points.

In all cases delivery dates are fixed by Purchasing, as we believe that successful production and material control depends upon coordination between Purchasing and the Production- and Material-Control Department. Whenever conditions change, Purchasing notifies the Production- and Material-Control Department of the change and they adjust their delivery time and their mimimum and maximum accordingly. We also check periodically to determine whether changes in production schedules necessitate a change in order points and maximums.

Although we are employing minimums and maximums on parts and subassemblies common to more than one model, we still check every month on requirements for those items that are used only on one model. In this way, we take no chance of being caught with unusable inventory should the model be discontinued.


DAYS
DAYS
DAYS
DAYS

PART NO. # 1009

NAME CYLINDER PLUG

MAX 30000 ACCT. NO. 4 LOCATION A-6

| PICK-UP | INDIVIDUAL ORDER BALANCE | TOTAL ON ORDER | TOTAL ALLOCATED | TOTAL IN STOCK | TOTAL IN PROCESS | PROOF TOTAL |
|---|---|---|---|---|---|---|
| | 21,000 | 21,000 | 10,000 | 5,000 | 11,000 | 17,000 |
| 21,000 | 15,000 | 15,000 | 4,000 | 1,000 | 15,000 | 27,000 |
| | 0 | 15,000 | 4,000 | 500 | 15,000 | 26,500 |
| | 0 | 15,000 | 4,000 | 1,000 | 15,000 | 25,000 |
| | 16,000 | 31,000 | 4,000 | 1,000 | 15,000 | 41,000 |
| | 0 | 31,000 | 4,500 | 1,500 | 15,000 | 40,000 |
| | 0 | 31,000 | 7,500 | 1,500 | 15,000 | 37,000 |
| | 0 | 31,000 | 9,000 | 3,000 | 15,000 | 34,000 |
| | 0 | 31,000 | 9,000 | 4,000 | 15,000 | 33,000 |
| 13,000 | 10,000 | 26,000 | 4,000 | 1,000 | 10,000 | 33,000 |
| | 0 | 26,000 | 4,002 | 998 | 10,000 | 32,996 |

FORM NO. 116

MFG. CO.

*... These totals are obtained automatically*

## How to Read the Master Control Card

***HEADING:***

Identification plus inventory-planning information.

***COLUMNS ON THE RIGHT OF THE HEAVY BLACK LINES:***

Total on order + Total allocated + Total in stock + Total in process = Proof total

Red entries are minus. Example, 1st line: Proof Total = 21,000 - 10,000 - 5,000 + 11,000 = 17,000.

***COLUMNS ON THE LEFT OF THE HEAVY BLACK LINE:***

Entries in the ALLOCATED column reduce figures in the Total Allocated column.

Entries in the DISBURSED column reduce figures in the Total in Stock column.

Entries in the ORDERED column increase figures in the Total on Order column.

Entries in the RECEIVED column, reduce figures in columns for Individual Order Balance, Total on Order, and Total in Process; increase figures in columns for Total Allocated and Total in Stock.

***EXAMPLE:***

The entry on the second line shows 6,000 Received on Order Number 56,846. This reduces the Individual Order Balance and the Total on Order to 15,000 and the Total in Process to 5,000. However, as 10,000 also were put in process, the Total in Process increases to 15,000. The 6,000 Received also increases the Total Allocated, bringing it up from -10,000 to -4,000, and the Total in Stock, raising it from -5,000 to +1,000.

In posting with the machine, operators know immediately if they make an error. To make a new entry, operators must enter in the machine the totals from the previous entry appearing in each column to the right of the heavy black line. If correctly entered, a black zero appears in the proof column to the extreme left of the card.

### Disbursements Are Coded

The third column from the left, *Description*, is for the Code Number of the model for which parts are allocated or disbursed. Service entries bear Code No. 9000 and the date and description number always are in red to distinguish them from all other entries. The same is true of scrap entries and, in this case, the description number is the same as the Inspection Report Number. The last entry on the card is an allocation and disbursement to scrap.

Not only is our new system saving time and effort in the production and material control department, but it also eliminates much of the paper work formerly filled out by our Chief Expediter and stock chasers. Three complete sets of *inventory and production service schedule* forms are issued monthly to our Chief Expediter. One complete set is kept in his possession and the other two sets are distributed by departments to our factory foremen and stock chasers. These forms are filled in complete as to part names, part number, monthly schedule per model, amount needed of each part and subassembly per model, monthly inventory figure per part and subassembly, the amount needed over and above inventory to fulfill the monthly production-service schedule, and the date needed.

Formerly, an individual shortage slip was filled out complete on each part and subassembly. This caused quite a burden on the Production-Material Control Office, and also on the expediters and stock chasers. This now has been greatly reduced.

### Only Four People Needed

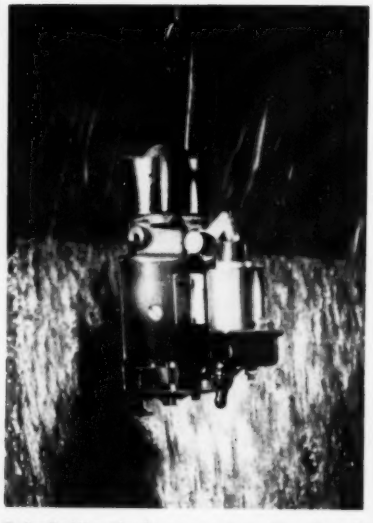
With this new system, we are controlling more than 3000 items, with the Production-Material Control Office using only two female and two male employees. Raw material, purchased parts, subassemblies, and manufactured items are covered, as well as production and service needs. All manual entries, postings, and extensions are eliminated, saving time, reducing fatigue, and eliminating the danger of error. The complete status of any item can be determined in a matter of minutes and, as a result of the ready availability of accurate management information, inventory quantities will be reduced, and inventory performance increased.

# SHOP SHOTS

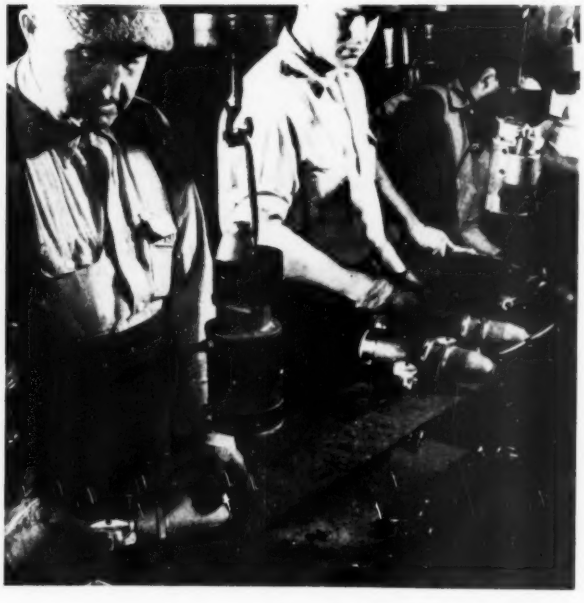
*at*

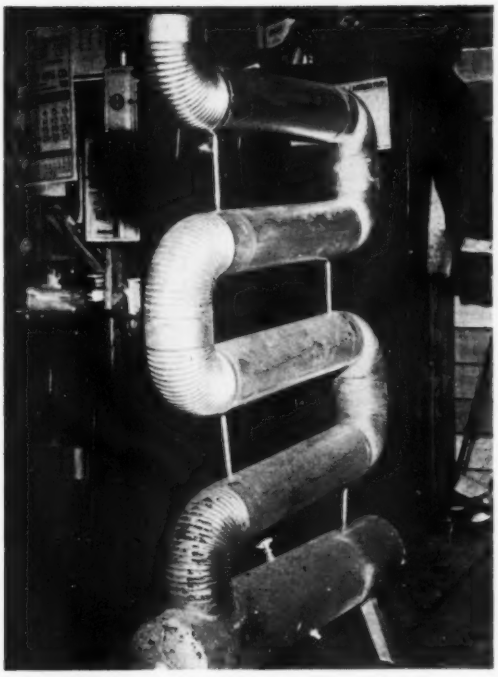
**CARBOLOY COMPANY**
**DELCO-REMY DIV., GMC**
**GORDON D. BROWN & ASSOCIATES**
**J. H. ROSE TRUCK LINE**
**MOTOROLA, INC.**

**Compensating jaws** on Brown air vise hold eight record-changer spindles so opposed flats can be milled on the spindle ends. Two 5-in. side cutters on Sundstrand miller operate at high speed to gash 577 pieces per hour. *Motorola, Inc.*

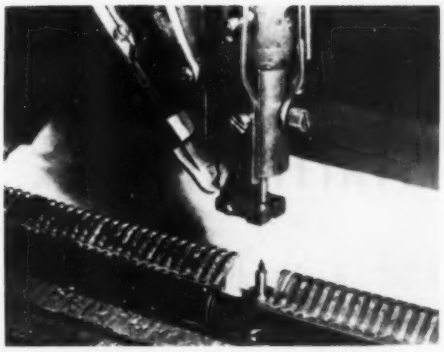


**Baby-bottle nipples** come into the shop to mask electric terminals on motors during a spray-painting cycle. Over 42,000 nipples wear out each year. Shape of the motor carrier on the conveyor masks the gear opening in the starter assembly. *Delco-Remy Div., G M C*

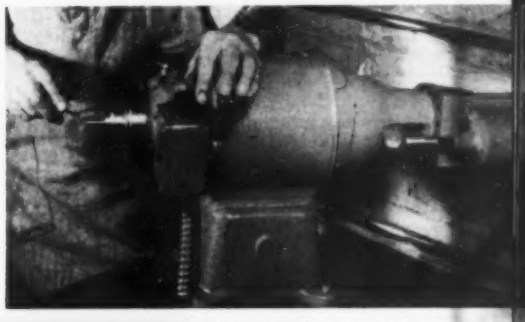




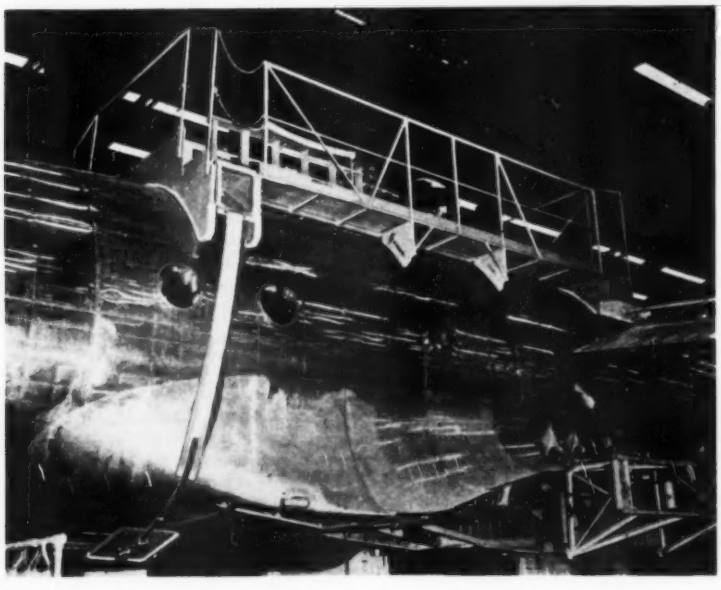
**Stovepipe gas heater** radiates more warmth than most commercial heaters for small-shop installation. Cylinder at base encloses burner. Hot gases travel up through pipe section to exhaust into room. *J. H. Rose Truck Line, Inc.*



**Riveting anvil** tipped with cemented-carbide blanks requires much less maintenance time. Operation is forming silver contact rivets at General Electric Schenectady plant. Total savings in tool cost and maintenance was 86%. *Carboloy Company*



**Air cylinder** mounted on bracket at end of Schauer speed lathe replaces hand-operated collet lever. Pedal valve controls stroke of 2-in. cylinder, freeing operator's hands to burr and polish small shafts. *Motorola, Inc.*



**Strap assemblies** designed for holding cargo inside freight aircraft secure scaffolds on top of Lockheed *Constellation* fuselages during assembly. Straps grip to any tension, release instantly. *Gordon D. Brown & Associates*

# STATITRON WILL...

## Workharden Aluminum Alloys

## Build Forces to Cause Failure

## Harden Non-Heat-Treatable Metals

## Alter Physical Properties of Metals...

# ...INSTANTLY

BY FRANK CHARITY
Los Angeles, Calif.

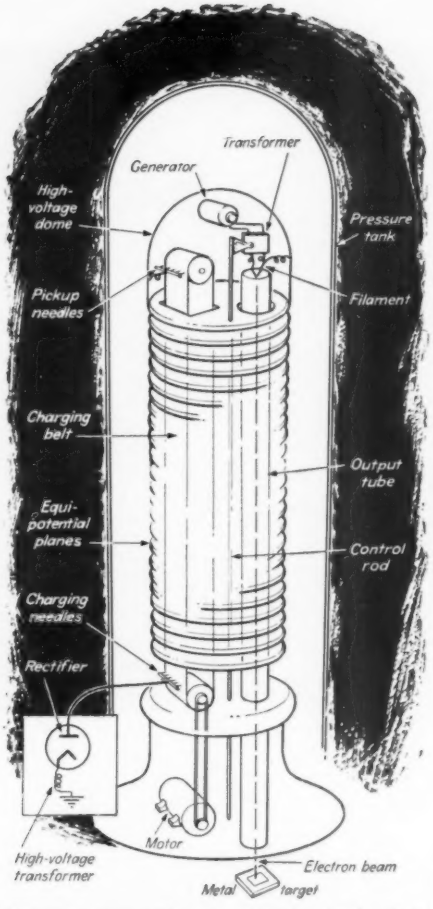
**ENGINEERING** tests to determine precisely the stresses that cause material failures in existing aircraft designs are now being conducted at North American Aviation, Inc., with the help of the Statitron.

Although specific applications cannot be discussed, as a result of security restrictions, it is known that the newly developed device will:

1. Build up, in materials, the forces that cause failure.
2. Accurately indicate the extent of destructive force at the moment of failure.
3. Provide radiations which make possible a photographic record of destructive force effects.
4. Harden or temper materials and parts not effectively heat-treatable by ordinary methods.
5. Provide internal inspection of alloys or components which cannot be penetrated by ordinary X-rays.

The Statitron is a midget version of the Van de Graff electrostatic generator heretofore used in production of atomic bombs. Briefly, it is an electromechanical device, intended to convert ordinary electrical current into a high-voltage electron beam which is similar in output to the X-ray machine, except that it has the intensity necessary to *alter the physical properties of metallic materials.*

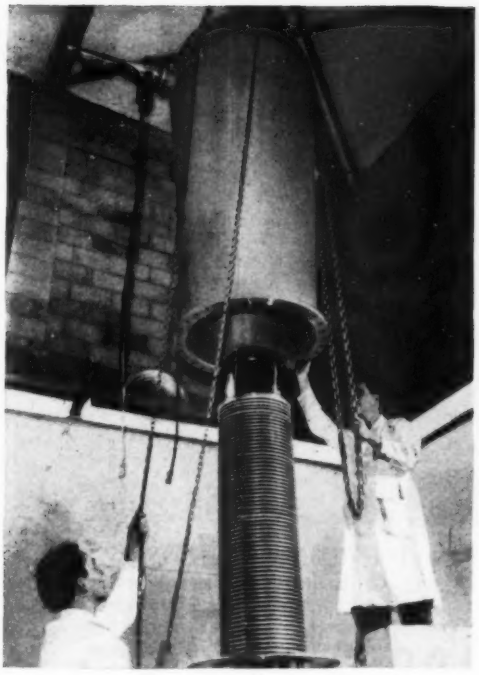
Unlike the cyclotron, the Statitron does not smash atoms, but does displace them. The result is much the same as the displacement of atomic particles by the operational stresses which cause a metal part to be work-hardened. However, its energy output can be accurately regulated for any specified physical effect in each circumstance.




**Statitron components** are relatively simple. Belt, driven by conventional electric motor, picks up charge from "charging needles"; conveys it to the top; transfers it, through the "pickup needles," to the high-voltage dome. When the accumulated charge is released, the "beam" passes down the output tube—60,000 billion electrons per sec strong—to the "target"

Power for the unit is from the standard ac factory line through a conventional high-voltage transformer and rectifier. This, initially, energizes a sequence of "charging needles" which, in turn, build up a strong electrostatic charge on an "endless" motor driven, friction-belt running vertically on two rollers in the steel-ring "tower."

Charges on the belt are constantly conveyed to a high-voltage collector dome at the tower top. Generator, transformer, and filament elements in the dome then cause as many as 60,000 billion electrons



←**Resembling a scale-model lighthouse,** the Statitron comprises a cylindrical "tower" 9½ ft tall, a base 30 in. high, and has a maximum dia. assembled, of 40 in. It doesn't look like a mammoth trip-hammer, but will work-harden a metal piece in a fraction of the time required by mechanical means

per sec to be accelerated downward through a vertical tube to bombard a "target" below the base. Particle speed is 186,000 miles per sec—equivalent to the speed of light.

In operation, the Statitron is housed in a pressure tank which is filled with dry nitrogen at 200 psi. This is in an insulated room and equipped with remote controls so its operation is controlled by men outside the room. Protection is necessary because the Statitron has a constant use-value potential of about two million volts. Although this is not sufficiently powerful to split atoms or convert materials to radioisotopes, direct radiations could be dangerous to operating personnel.

Designed by North American engineers, including Drs. Donald Eggen and Norman Huston, physicists; C. J. Thompson, ME; and Harry Irmsher, technician, the Statitron is similar in principle to previously constructed devices, but is believed to have the following distinctive advantages:

1. A comparatively simple, compact unit with more than enough available power for a majority of industrial applications.

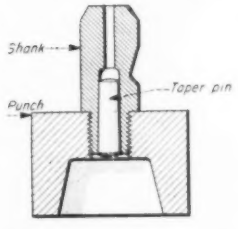
2. A construction cost within the budgetary limitations of many business organizations and government-sponsored institutions.

3. Principally useful as a source of electronic energy, rather than as a source of proton, deutron, and alpha radiations as are the Van de Graff generators used by AEC.

*Is there any direct connection between high-speed, hot-spot, or ultrasonic metal removal, and intermolecular energy?* Physical changes in metals exposed to the Statitron electron-beam are one more indication that there is . . .

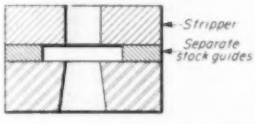
# DIEMAKER'S KINKS

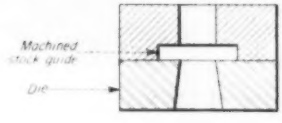
BY FEDERICO STRASSER

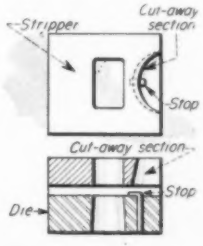



**LARGE PUNCHES** are safely mounted by driving a taper pin into the shank at the threaded end. The through hole is a convenient means for driving out the pin when the punch must be removed.

**STOCK GUIDES** may be separate pieces or obtained by machining a channel in the stripper, as in European practice. The latter method is more expensive, but does produce greater strength and precision.




**VISIBLE STOP PINS** should be used in blanking and progressive dies. If the operator can see the stop pin and how the scrap skeleton registers with it, his confidence and output are bound to increase. To make a stop pin visible, simply cut away a portion of the stripper to produce a "window."

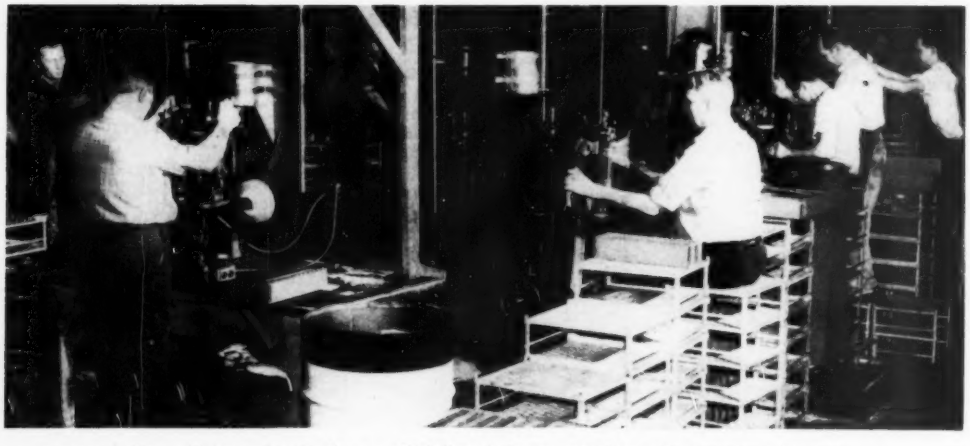
**Loading** of converted filer is simple. Operator slips a blade into special jaw, clamps lapping heads so that pressure is applied to abrasive-cloth strips as blade reciprocates

**Forged surface** of blade must be smoothed to 16 micro-inch finish, to minimize dirt pickup in service and fatigue failures

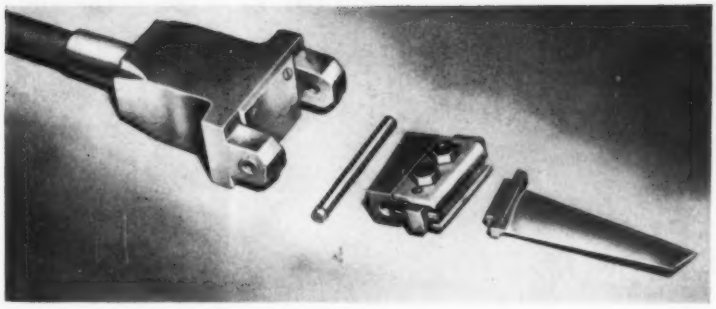
# CONVERTED FILER LAPS JET BLADES AT WRIGHT

**Both sides of the air foil are finished at once on a filing machine converted to use abrasive-cloth strip . . . Finish: 16 micro-inches**

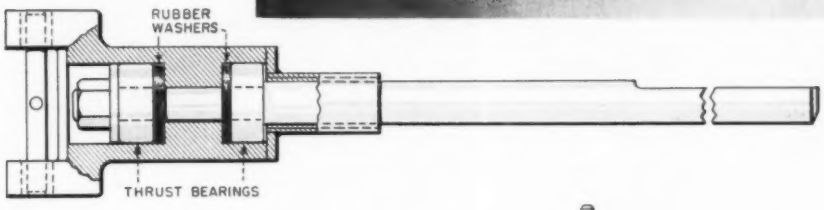
BY RUPERT LE GRAND, ASSOCIATE EDITOR



**Converted filers** will be replaced with a multistation, indexing machine. One operator will then produce a blade every 6 sec. Finishing action at the various stations can be varied, if required



**Special jaw** for work arbor holds blade. Pin establishes location. A shock-absorbing connection between the jaw and arbor is necessary to prevent snapping the shaft from repeated reversal of stress. Rubber inserts and thrust bearings provide resilience



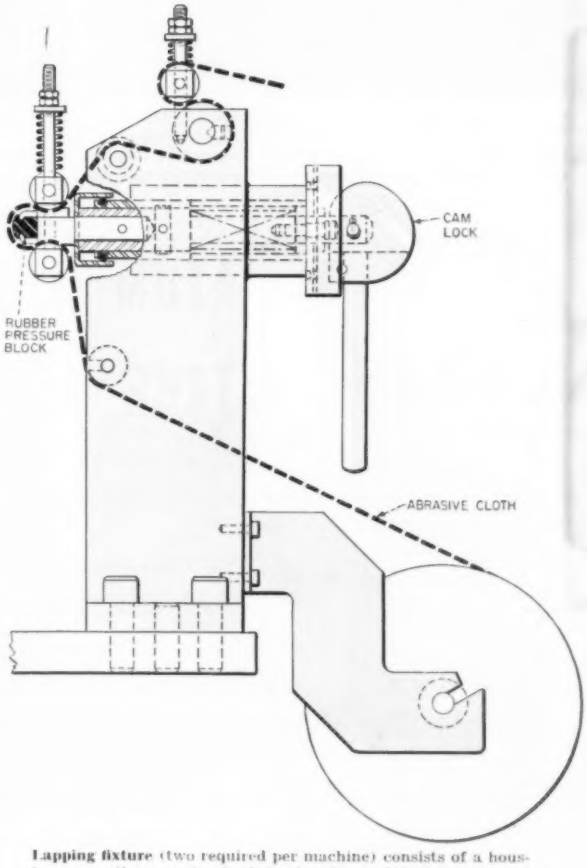

FORGED JET-ENGINE BLADES must be polished to remove oxides and slight surface irregularities. Also, the scratch pattern must run from tip to root in order to avoid stress raisers. Because hand finishing is too slow, process engineers of the Wright Aeronautical Corp., Wood-Ridge, N. J., converted vertical filers. They designed column-like lapping fixtures to be placed on the filer table. Abrasive-cloth strip is pressed against both sides of the airfoil as it is reciprocated vertically by the machine.

The blade root is inserted in a special jaw that replaces the file grip. End-wise location of the blade root is established by a pin in the jaw. Six jaws handle 26 sizes of jet blades.

The original reciprocating member for the file grip could not withstand shock loads imposed by sudden stroke reversal while abrasive is in contact with the blade. Hence, a new member was constructed, wherein thrust bearings and a rubber insert provide a degree of resilience. Stroke is adjustable, of course, to suit the several lengths of blades required.

Lapping fixtures press abrasive-cloth strip against both sides of the air foil. Each lapping arbor is advanced by a spring-loaded, cam-operated clamp. A heat-treated spring capable of exerting 65 lb pressure per inch of deflection has been found necessary.

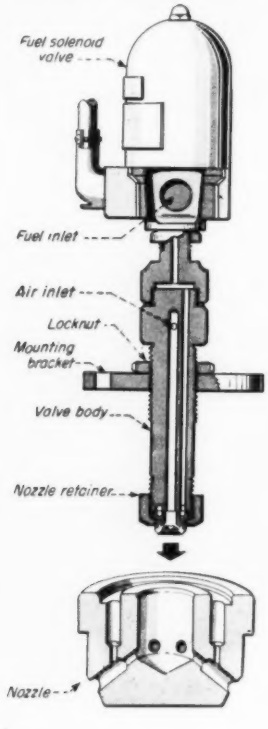
Lapping-fixture arbors are fitted with jaws to take molded-rubber inserts. These are formed to the male and female contours of the blade. Rubber of 70-80 durometer has been found suitable.




**Lapping fixture** (two required per machine) consists of a housing supporting a spring-loaded arbor for applying pressure upon the abrasive cloth. Rubber insert is molded to blade contour

**1 Stainless nozzle** is located and clamped in round jig, then jig is located and clamped in inclined or horizontal holder under spindle. Notches in jig OD are engaged by hand pin in holder for indexing

**2 Drilling** is done at 4000 to 6000 rpm, depending on drill size. Two stations drill at 50° angle, two drill vertically, and two ream—one at each alignment. Tools are dipped in oil cups before each pass



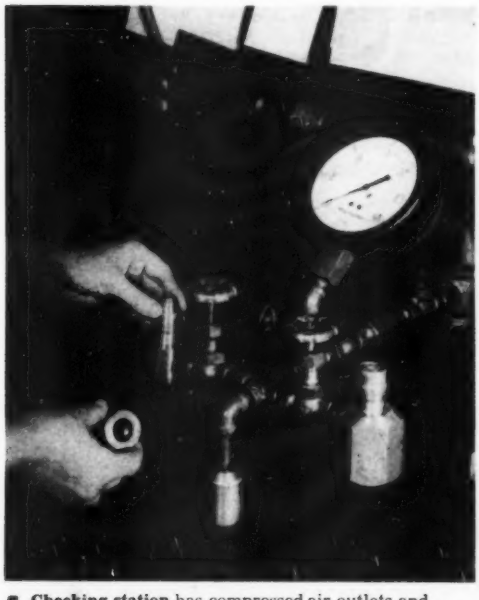

# ATOM (izer) HOLES TAKE ADROIT DRILLING

BY LOUIS GROSS, Machine-Shop Foreman, VAPOR HEATING CORP.

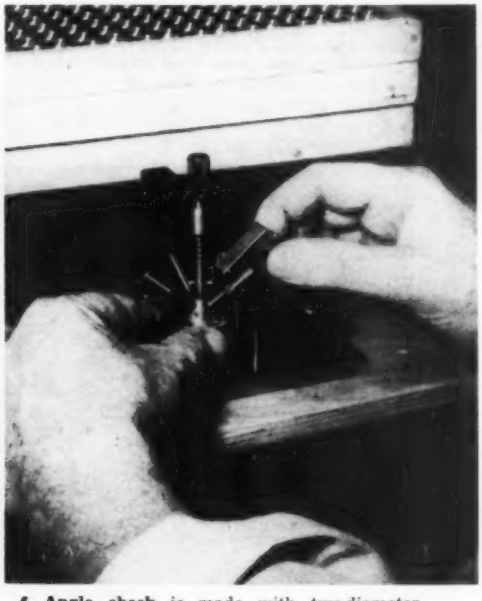
**No. 3 diesel fuel, at 20 to 55gph, fires a Vapor-Clarkson steam-generator nozzle through six atomizing holes. Efficient combustion demands that the spray pattern fit exactly the baffle layout inside the combustion chamber. The way to do it so accurate nozzles (left) are produced is to line up six adjustable-speed machines to drill, ream, and counterbore the holes while the nozzle blocks are gripped in small indexing jigs that will clamp to the exact angles required**

**3** **Reaming** is done at 5000 rpm with four-flute, ground-from-solid reamers to finish 0.0295- and 0.0415-in. holes. All drill spindles are set to cut to correct depth

**4** **Chamfering** is done with hand tools after last drilling operation. Same operator checks diameters of all holes with plug gages. After this, nozzles are hydrogen-hardened and seal face is lapped

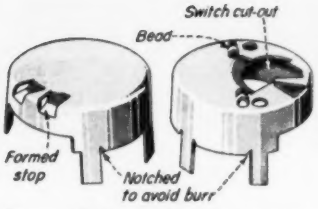


**5** **Checking station** has compressed-air outlets and gage so nozzles can be coupled, 50 psi can be applied, and back-pressure can be read off. Different pressures are checked against standards

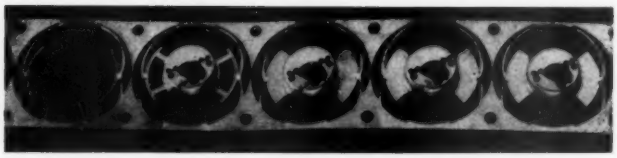


**6** **Angle check** is made with two-diameter plugs in orifices and nozzle clamped down on surface plate. If split in gage passes around the plugs, angles of holes are within tolerances

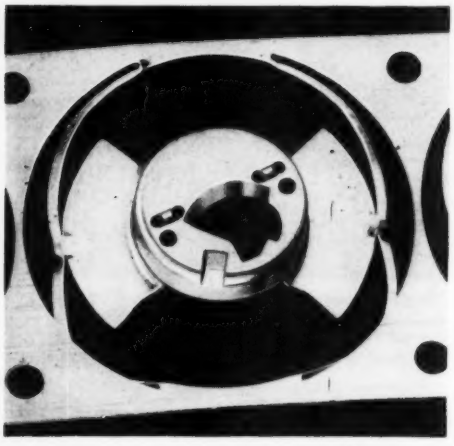
THREE --->




Removable die section permits making volume-control covers with or without switch cut-out as required



| 13 | 12 | 11 | 10 | 9 |
|---|---|---|---|---|
| CUT LOOSE AND FINAL DRAW | TRIM FLANGE AND LEGS | IDLE | SHEAR AND FORM STOP | FORM BEADS FOR STAPLE CLEARANCE |



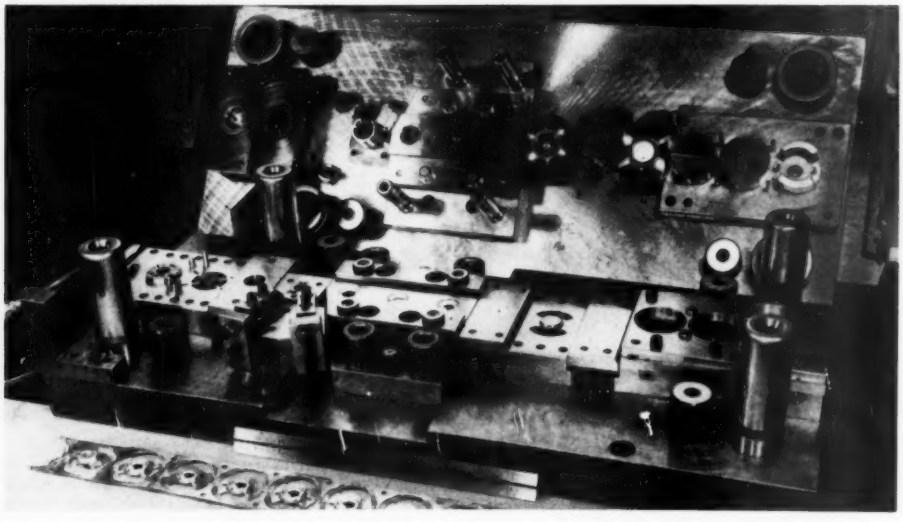
Scrap suspension acts like a spring mount to allow cup to be drawn without distorting strip or changing lead. Cup shown 1½ times size

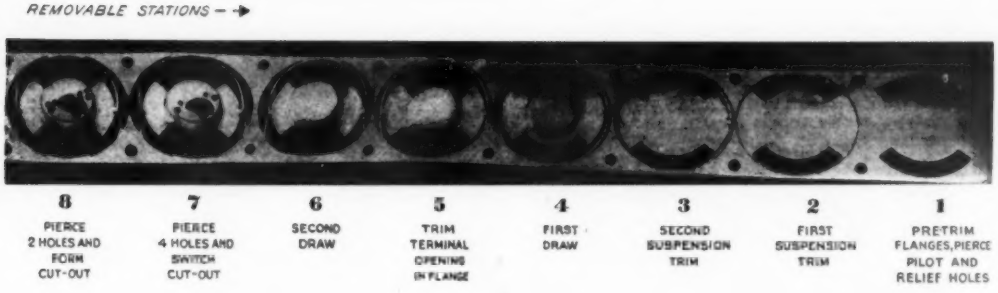
# SCRAP SUSPENSION MAINTAINS LEAD IN PROGRESSIVE DIE

**Blank is carried along by four circular segments that flex to allow the part to be carried down into die openings for drawing, forming and piercing operations...Strip is thereby not distorted and press can operate at 110 strokes per min.**

BY RUPERT LE GRAND, Associate Editor

Die sections are mounted in a channel in ↓ dieset base and are screwed and doweled






MASS production of covers for radio volume controls posed a number of die problems to the John Volkert Metal Stampings, Inc., Queens Village, N. Y. These covers are of two types. One has pierced holes in the bottom of the shell, the other does not. Both have two sheared and formed stops that apparently must be sheared against the shell wall—an impossible condition. Because the product is drawn, some means had to be found to avoid distortion of the strip between operations and changing the lead on pilot holes.

The successful progressive die used to make these covers is a 13-station tool built into a 4-post dieset 30 in. long. Station components are too large for matrix construction (*AM*—April 2, 1951, p88), hence die sections are fitted into a channel ½ in. deep by 4 in. wide, and are screwed and doweled in place. A removable sub dieset at stations 7, 8, and 9 pierces the several holes involved in one design of cover.

Volume-control covers are produced from 0.018-in.-thick strip, either brass or tin-coated steel. Brass parts are preferably run first. After running 500,000 of these, it is still possible to get 300,000 steel parts before a regrind. Steel dulls the tools more than brass.

Supplementary notes on the operational sequence are:

1. Stress-relief holes take stiffness out of flanges, allow them to move as needed.

2. Punch with slot front to back trims outline of spring suspension, leaving tabs front and back to hold suspension to strip.

3. Punch with slot running in feed direction cuts circular trim line inside the first trim, leaving tabs at left and right to hold workpiece to spring suspension.

4. Draw 0.018 in. deep.

5. Developed trim for slot in side wall of cup produces better results than a notching operation.

6. Draw to 0.271 in. over-all height.

### Sub-Die Section

7. Pierce four holes and switch cut-out opening.

8. Pierce two more holes (too close to previous ones for handling in prior operation) and form down a portion of switch opening.

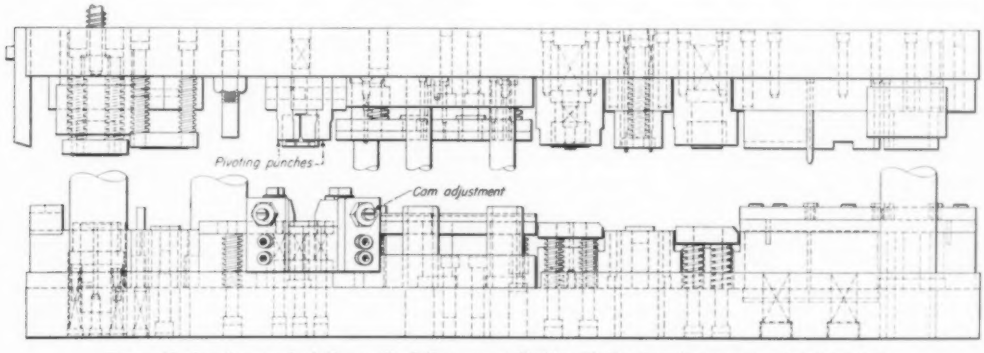
9. Bead between the two small holes.

10. Shear and form two stops. To avoid shearing on a vertical wall, a spring pad holds the cup down. Punches have heels that contact cams on die member. These cams are screw adjustable toward center of work. Punches hit the cams, then pivot on pins to strike work at 45° angle.

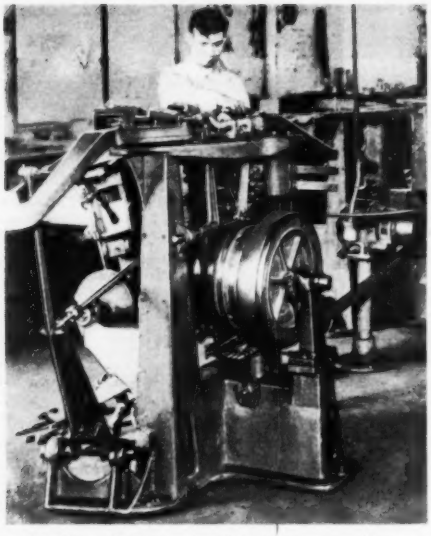
11. Idle.

12. Trim the flanges, leaving four legs. Punch consists of four sections held in a split-type punch holder, which is hardened and ground. This construction was necessary because of the small narrow notch produced at the junction of the legs and the cup body. This slot removes a troublesome burr that would otherwise prevent seating of the switch-body component of the volume-control device.

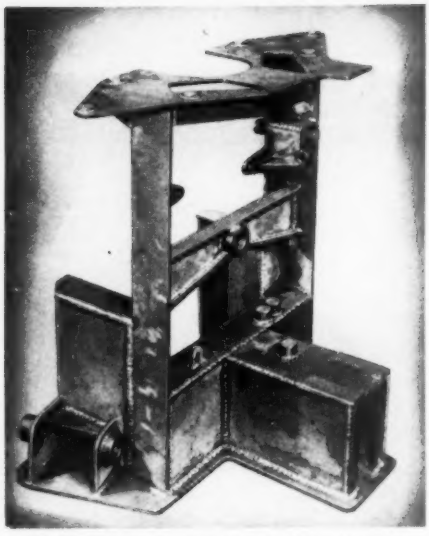
13. By compound operation, the part is cut from the suspension and the legs are drawn out parallel with cup wall. A mechanical knockout kicks out the piece and an air blast directs it to a chute.




To avoid shearing against the wall of the cup at Station 10, the forming punches for the stops pivot after hitting adjustable cams and then strike the cup at an angle of 45° to the vertical



**Cast-iron frame** weighed 750 lb, and patterns had 18 sections and 32 cores. Several hundred moving parts are attached to it at assembly. Production was in lots of ten machines



**Welded frame** designed for building in small shop. Square pieces were warehouse sheared, small pieces torch cut. Top and three nested pieces were cut from 94×22×½-in. plate

# WELDING SEWS UP A COST PROBLEM

BY CHARLES G. HERBRUCK
James F. Lincoln Arc Welding Foundation

**Conversion from casting to weldment is not always easy, but one company did it and cut costs 36%**

BECAUSE of rising costs, the Baltimore Broom Machine Co. decided to redesign the main frame of its automatic broom-sewing machine as a weldment. To save time and expense it was decided to use existing jigs and fixtures for machining. It was also necessary to use the numerous appending parts in their cast form. These considerations dictated that the weldment be largely a copy of the casting, although this is generally recognized as a handicap in economical weldment design.

A second major problem was that the company, being small, had no engineering staff in the usual sense.

Finally, no plate-bending equipment was available, and procurement of this was both difficult and inadvisable.

The company, nevertheless, went ahead, obtained a welder, cutting equipment, and a bandsaw, and built a preliminary plywood mock-up.

As the basic design of the casting had proved satisfactory, the thickness of steel to be used was selected by proportion from the comparative strengths of the two materials. Advantage was taken, wherever possible, of lighter sections permitted by welding.

With the exception of bosses and two side columns, the entire first design was made of flat steel plate. The two side columns were made from 5×5×⅜-in. angle, flame cut on one side to provide a taper toward the top. This eliminated two 44-in.-long, ⅜-in. corner welds, and also avoided a major source of warpage in the weldment.

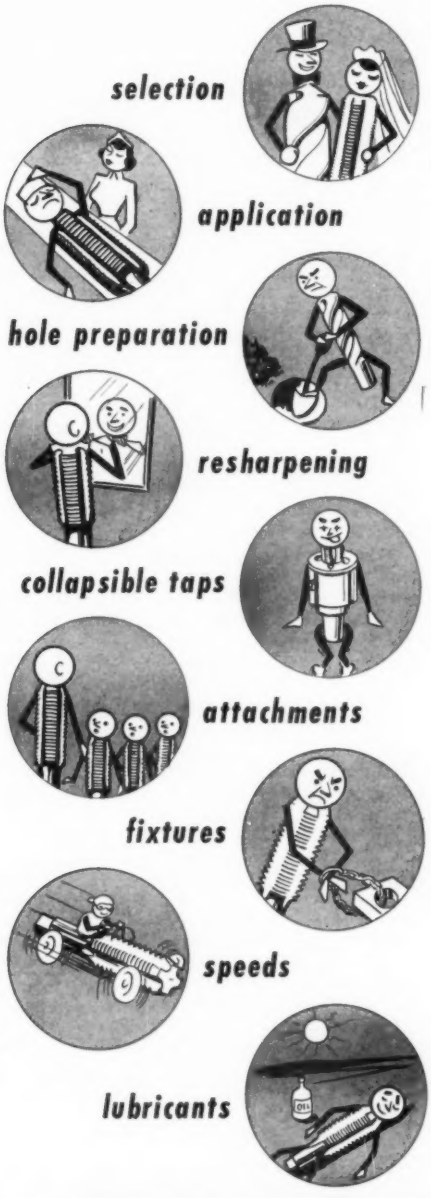
In designing the front pieces, the possibility was considered of cutting them all in a single piece and incorporating the two lugs. Estimates indicated that there would be no savings, and storing of bulky parts would be objectionable. The adopted design required, for both sides, only 5 ft. of ⅜-in. butt welding to join the five pieces together.

The unusual shape of the base plate caused some concern. Facilities for handling a large ⅝-in. plate were not available, so by cutting the rear section from the front gap and joining it in place with a 12-in. butt weld, very little scrap was left from an 18×44-in. plate, a size readily handled.

Waste was 100 lb per frame, or 22% of the net material weight. The amount of flame cutting after warehouse shearing totaled 85.7 ft, mostly on ⅜-in. plate. Nearly all welding was ⅜-in. fillet, about 80 to 90% of which was flat. Positioning was done with a chain fall over the welding table.

Even compared to cast iron costs at a depression low figure, the cost saving was 36%. In addition, weight was reduced 33 1/3%, and the structure was actually stronger than the casting. Furthermore, design can now be changed readily to make additional improvements.

# BETTER TAPPING...




BY WM. M. STOCKER, JR., ASSISTANT EDITOR

**Shop men frequently buy taps when they should buy threaded holes. The two are not necessarily synonymous. The cheapest tap, in the final analysis, is the one that produces the most threaded holes, to specified tolerances, per dollar spent; not the one that is cheapest—or most expensive—initially.**

**Taps are often regarded with fear, seldom with the respect or consideration they deserve. They are expected to do much more work than most other cutting tools, and to do it under adverse conditions: cramped chip space, insufficient lubricant, feed fixed by lead. Indifferent or irresponsible tap selection and application will promptly be reflected in mounting tapping costs; taps lightly bought and roughly used will more than earn the classification of "perishable" tools.**

**Proper tap selection begins with analysis of the thread to be cut: material, size, tolerances, character, ultimate use, and number. It progresses through properly engineered application and maintenance. This Special Report provides latest data from makers and large users in organized and condensed form. It will repay your careful study by cutting your costs per threaded hole.**

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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# CHOOSE THE RIGHT TAP

Tapping trouble, in 95% of the cases, is a result of one or more of the following 12 errors:

1. **Machine Size**—too light or too clumsy for the work
2. **Alignment**—machine spindles out of line with work
3. **Drilled hole size**—diameter too small or too large; usually too small
4. **Equipment condition**—sloppy spindles or sticky chucks
5. **Holding**—improperly designed fixture
6. **Chamfer**—improperly ground for the job
7. **Tap style**—wrong tap, incorrectly ground, or *dull*
8. **Tap flutes**—number of flutes not suited to hole size and material
9. **Tap cutting-edge angle**—incorrect for particular material
10. **Tap lands**—not proper width for material
11. **Thread percentage**—not individually determined for hole depth
12. **Lubricant**—none, or improperly selected lubricant (not coolant)

Probably the most frequent error is improper choice of tap. Certainly, if this is wrong, it is far more difficult to determine other contributing errors. In making this choice, certain general rules apply which narrow the possibilities. These are not absolute. Two jobs that appear identical may require different tapping techniques. For a short-run job, one tap may serve to thread both satisfactorily. But high production efficiency can demand a separate tap design for each.

Taps are in two groups only. These are the **solid taps,** either cut or ground from solid stock for use manually or with a machine; and **collapsible taps,** which are dieheads turned inside out. Thus, the latter depend for cutting on inserted chasers. They are used with automatic lathes, turret lathes, screw machines, and special threading machines. They may also be used with an engine lathe for quantity production of large threads. Collapsible taps are of two types: **revolving** and **stationary.** Chasers are either radial or circular.

Solid taps are, by far, the more common. Collapsible taps are used almost entirely for production threading in large sizes. In this field they represent a sizable saving in tool life, replacement, and output.

A tap is simply a single-point, internal threading tool with the number of points multiplied to reduce the number of passes necessary to produce a completed thread and to make threading possible without a leadscrew. All straight-tap cutting is done by the chamfer and first full thread. Following threads provide lead and support only, plus material for resharpening the tap. Tapped threads will always be better if the tap is leadscrew controlled. All rules for single-point threading must be considered when a tap is designed. All threading tools are designed, primarily, to *form* material. The sharp points cannot be expected to take the tool loads applied to straight turning tools.

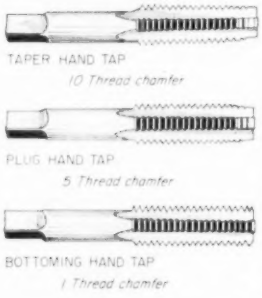
## HAND TAPS

Hand taps were originally designed for threading by hand. Now, most hand taps are suitable for machine tapping as well. However, it is usually better practice to select the tap specifically for a machine operation. Also, with most materials, the spiral-point, or "gun", grind is more efficient.

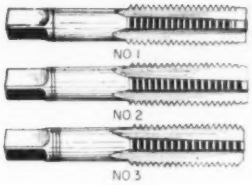
Probably the best-known hand-tap group is the popular set consisting of **taper, plug,** and **bottoming** taps. These are identical in size, length, and vital measurements; differ only in the chamfered portion at the tip. The taper, or "starting", tap has a chamfer length of 8-10 threads; is the longest chamfer of all. The plug tap (by far the most popular) has about 3-5 threads chamfered, and the bottoming tap only 1-1½ threads chamfered.

**Taper hand taps** are intended for use when tapping coarse threads by hand in open or through holes; especially for the harder metals. Manually, they help insure straighter starting. As tool life and breakage are largely determined by chamfer length, taper taps should always be considered when the job permits their use. Blind holes seldom provide enough room for taper taps to develop a full thread.

**Plug taps** are designed for use in through or open holes when tapping softer metals or fine pitch threads. Blind holes may also be tapped with this style, if sufficient clearance is provided below the thread, to clear chamfer and chips. This comes




**Most common taps** are the taper, plug, and bottoming series. Each of these cuts a full-size thread. They vary only in chamfer length. Sketch shows cutting action of each type—compare with sketch for serial taps




**Serial hand taps** vary in dia. No. 1 is smallest and No. 3 largest. All three must be used to complete the threads. Nos. 1 and 2 are chamfered; No. 3 is bottoming. Sketch shows approximate amount of material removed by each tap

*Section showing approximate amount of material removed by each serial tap*

closest to being "universal", but it is not, by any means, an all-purpose tap. *There ain't no sech animal.* Plug hand taps are also used for machine tapping, but should be purposely selected for a specific job; not chosen at random. If the material is such that cuttings crumble or break easily, a hand tap will perform effectively. Chips that ball up or are stringy are likely to cause the hand tap to jam; invite breakage. Taps for machine use should be chosen to provide more chip clearance, deeper flutes, spiral flutes, or shoot the chips forward through the hole; thus offset this condition.

**Bottoming hand taps** are seldom really necessary, and are least efficient. Their one use is for threading to the bottom of a blind hole. To do this they are permitted a 1-1½-thread chamfer only. This means that, at most, four to six teeth do all the cutting. Chip load per tooth is tremendous as compared with plug or taper taps. The bottoming tap should always be preceded by a plug tap. For coarse threads or hard material, both taper and plug tap should precede bottoming. Chips must be removed from the hole before the tap is run to the bottom. *Designers should avoid the use of bottoming threads in blind holes.* It usually adds at least one operation and greatly increases tool wear and tap breakage.

**Chamfer importance can never be overstressed.** The chamfer on a tap or chaser provides the cutting edges. Longer chamfers mean more cutting edges. Designs which show consideration for this will save money in production operations. Shopmen realize the value of long chamfers, but can use them only when the part drawing will permit it. Threading costs are largely controlled by the man at the board. Without through holes or sufficient clearance in blind holes, efficient chamfers cannot be used. In all but special cases, the plug tap chamfer of 3-5 threads should be maintained.

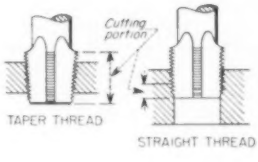
Pipe, pulley, machine screw, stove bolt, and other tap styles, are occasionally used by hand. Nevertheless, when the name "hand tap" is used it has reference to the taper, plug, and bottoming styles just described.

**Serial hand taps** are often confused with the taper-plug-bottoming taps. Actually there is considerable difference. Serial taps are usually used in sets of three and numbered 1, 2, and 3. Each tap, in sequence, cuts a larger percentage of the thread to be produced, with the No. 3 completing it. Unlike the bottoming hand tap, the No. 3 serial hand tap must always be used, and must be preceded by No. 1 and 2. Dividing the working strain among the three taps greatly lessens the possibility of breakage, and simplifies hand tapping for many otherwise difficult jobs. These taps are recommended for tapping deep holes, open or blind, by hand, especially in tough metals such as stainless steel or nickel. They cut more easily and produce smoother threads than ordinary hand taps.

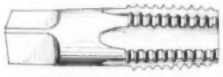
**Machine-screw taps** are really small hand taps, but are designated by No. 0 through 30, instead of fractional sizes. Each number represents a decimal size which corresponds to certain "machine-screw" diameters. No. 0, equivalent to 0.060 in. OD, is the smallest in the set. From this size, each sequential number represents an increase of 0.013 in. dia. However, modern practice seldom requires sizes beyond No. 14 which is 0.242 in. dia. Even the use of No. 14 is waning as a result of its proximity to ¼ in.

Engineers and designers should, wherever possible, specify machine-screw sizes for tapped holes below ¼ in., because screws in these sizes are more readily available than fractional sizes. (Machine-screw standard numbers should not be confused with wire-size numbers.)

**Stove-bolt taps** are used principally for tapping nuts for stove bolts, which originally were used only to hold stove parts together, but now are specified for many other fastening applications. Sizes ranges from ⅛ in. to ½ in. There are two standards: One is the old "Manufacturers Standard", the other a comparatively new ASA and Federal specification called "American Standard." Both are commonly used, but the new "Amer Std" permits the use of standard stock machine-screw and hand taps in both carbon and HSS. The old "Manufacturers Std" taps are similar in physical dimensions to plug hand taps, but have a different pitch for all diameters except 3/16-24, 5/16-18, and 3/8-16, plus a slightly




**Taper-thread taps** utilize all of the teeth for cutting. Straight holes should be taper-reamed before threading to prevent overloading the tap



**Interrupted - thread taper pipe tap** provides cleaner cutting, better lubrication. May be produced by grinding out every other tooth on consecutive lands. However, it reduces by ½ the number of cutting teeth available. Tap may be purchased in this form

larger PD than hand taps of similar size and pitch. These differences must be considered, and the proper standard specified, when taps are ordered.

**Taper pipe taps** are used for pipe fittings and in other places where extremely tight fits are necessary. To accomplish this, the threaded portion is tapered. Tap diameter, from bottom to top of threaded portion, increases at ¾ in. per ft, but the angle formed by the sides of the thread is 60° when measured in an axial plane, and a line bisecting this angle is perpendicular to the tap axis. These taps differ in action from straight taps as *all the threads or teeth cut*, rather than just the chamfered portion.

### *Interrupted Thread*

Taper pipe taps are also made with interrupted threads, and may be applied wherever tough material must be tapped.

Regular taps provide the same thread strength but the tap cuts on both sides of every thread. This added strain is sometimes excessive; causes metal from the crest to adhere to the tap root, hence produces a torn thread and a loaded tap, when tapping soft, stringy material. By removing alternate teeth in successive lands, a groove is provided which permits chip escape, plus thorough lubrication of the material just ahead of the cutting teeth.

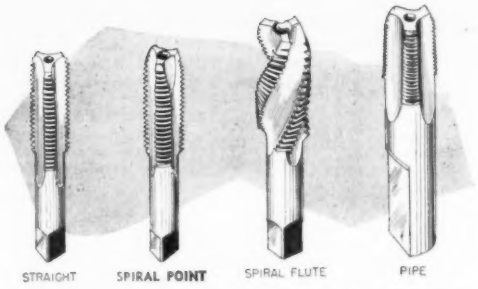
Taper pipe taps are marketed with full and interrupted thread. Where necessary, the same principle may be applied to straight taps for threading tough materials, if a reasonably long chamfer is usable. By grinding out alternate teeth on successive lands, in the chamfer and first full tooth portion only, cutting will be cleaner and lubrication more positive. However, chamfer must be of sufficient length to prevent overloading the reduced number of cutting teeth. Coarse threads will require leadscrew control.

In addition to better cutting, the interrupted thread on a taper pipe tap produces a sharper crest in the minor dia of the part, which improves the pressure-tight fit. In assembly, the sharp crests contact the flat roots just before the thread flanks match, thus when makeup is completed, these sharp crests are swedged into the flats; the helix is completely sealed.

**Pulley taps** are hand taps with long shanks designed to reach oil cup and setscrew holes in pulley hubs. The shanks are the same basic major diameter as the threaded portion. Taps are inserted through the holes in the rim, which are slightly larger than the tap shank. This insures alignment and straight entrance into the holes to be threaded.

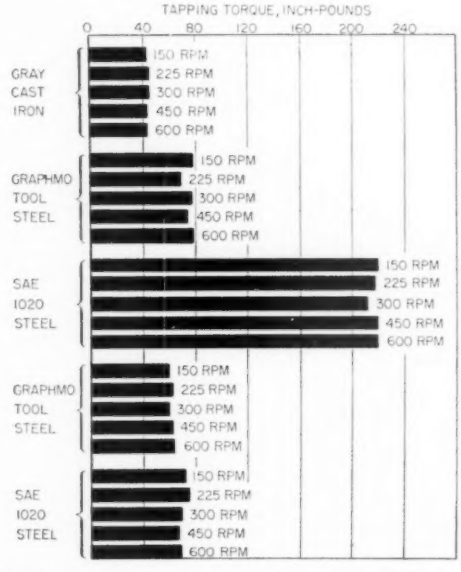
## MACHINE TAPS

Tapping by machine differs from hand tapping in one important way. Cutting action, in machine tapping, is continuous rather than intermittent. Therefore, means must be provided to clear the continuous chip formed and to get lubricant to the tool interface. This is more important when chips are stringy and tough than it is when they are brittle and readily crumble. Tapping-torque tests have shown that chip interference has a tremendous influence on tap efficiency. The increased speed of machine tapping would appear also to have an important effect. Actually, torque varies very little throughout the entire range of surface speeds for any given tap design or material.

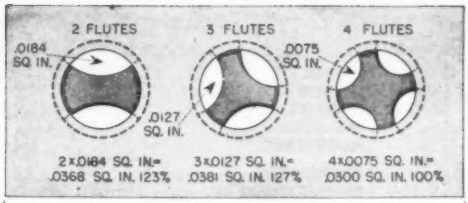



**"Stringy" chips are a problem** when tapping aluminum. Hence, these taps all have deep flutes. The spiral point and spiral flute are the most efficient. Meanwhile, the sketches show clearly a comparison of common tap styles

**Most efficient of the machine taps** is the angular-fluted chamfer, spiral-pointed, or "gun" tap. This is a straight-fluted tap, similar to a plug tap, which




**Varying tapping speed** does not affect torque appreciably but tap style does. Improved chip removal with the "gun" tap reduces torque, in 1020 steel, from 220 to 60 in.-lb. A ⅜-16 HSS plug tap with 4½° hook was used to tap 9/16-in. stock to 75% thread depth. Sulfur-base cutting oil was the lubricant


2 FLUTES
3 FLUTES
4 FLUTES
.0184 SQ. IN.
.0075 SQ. IN.
.0127 SQ. IN.
2×.0184 SQ. IN.= .0368 SQ. IN. 123%
3×.0127 SQ. IN.= .0381 SQ. IN. 127%
4×.0075 SQ. IN.= .0300 SQ. IN. 100%

**2-, 3-, and 4-flute,** ⅝-16 NC taps as they would appear in a 5/16-in. dia drilled hole which produces 77% of full thread depth. Flute space area is measured. If area is 100% for 4-flute tap, area of 3-flute tap is 127%, and 2-flute tap is 123%, relatively. Use of fewer flutes provides more chip space but, conversely, reduces the number of teeth and the tap strength, hence adds more load with greater danger of breakage. Each special application should receive individual consideration with regard to fluting and grind

has had an angle ground into the flutes at the chamfer. As it cuts, the chips are deflected by this angle so they leave the hole ahead of the tap, hence do not travel up the flute to cause binding. This means that flutes are left clear for the passage of lubricant. This tap design has very little improving effect in materials such as cast iron, but, torque tests show, it will increase the efficiency of steel or nickel tapping by as much as 70%. Blind holes should not be tapped with this tap unless there is plenty of clearance at the bottom. All chips will be packed there and will cause the tap to jam and break. Also, this design cannot be used for taper threads. On through holes, higher tapping speeds may be used with less fear of chip-jamming. **Designers note!**

Alignment is important for accurate tapping. It is much more readily obtained by machine tapping than by hand tapping, unless a hand tapping machine is used. Having plenty of flute space is also desirable. One way to obtain this, without weakening the tap, is to reduce the number of lands to three or two. For a given tap, decreasing the number of lands increases cutting load and makes alignment, or smooth starting, more difficult. Hence, taps to be used by hand should have as many lands as possible, except the very small taps which have less than four lands. These require very little effort, but should be mechanically centered.

Taps selected for machine use often have one less land than taps of the same size for hand use. Angular fluted chamfer taps do not lend themselves to hand tapping, particularly in larger sizes.

Nut taps are designed for machine use and for tapping nuts. A long chamfer is provided to distribute the load over many teeth and to facilitate easing starting. The shank is made smaller than the minor dia of the threads; thereby, several nuts may be gathered on the shank after being tapped. When the shank is filled, the tap is taken out of its holder and the nuts removed. Thus, the necessity of reversing the tap after each nut is threaded is eliminated.

**Tapper taps** are of two styles: straight shank and bent shank. They are generally used by nut manufacturers for production tapping. In primary function they are the same as the nut tap, but structurally they differ in several respects. Their over-all lengths are greater, their thread lengths, and chamfers shorter. Furthermore, they often have 3 flutes in the sizes in which nut taps have 4 flutes.

**Bent-shank tapper taps** are the more widely used in production nut tapping. They are used exclusively in automatic nut-tapping machines. Tapping in these machines is continuous. Nuts are fed to the machine from a hopper and after the nut is tapped, it passes on over the shank and is automatically ejected. Tapped nuts on the shank keep it centered in the slide.

Nut-tapping machines are manufactured, at present, in seven sizes. As capacities of some of these overlap, bent-shank tap orders should specify machine size. Each machine requires a certain shank length; also, the radius of bend in the shank varies for each machine.

### *Tapping Stampings*

**"Stub" taps**—Thin parts or shallow holes such as are found in radio parts, lamp sockets, thin sheet-metal parts, and other light-material assemblies, may be tapped with "stub," machine-screw, "hand," or "angular-fluted chamfer" taps to reduce the danger of breakage.

Automatic tapping machines usually used for these jobs run at high speeds. Hence, greater tap rigidity is desirable. "Stub" taps, in machine-screw sizes 3-12, are shorter than regular taps. Also, they have tapered flutes which provide for a gradual increase of the flute-core diameter toward the shank. To provide for maximum chip room, all sizes of "stub" machine-screw hand taps have 3 flutes; "gun" taps have two flutes.

These taps are recommended for use in electric or pneumatic hand drills and tappers.

**Spiral-fluted taps** should not be confused with spiral-pointed taps. A spiral-fluted tap resembles a spiral-fluted reamer—with teeth cut in the lands. These may be used for hand or machine tapping; are another design for improving chip removal. The spiral flute provides a more natural path for continuous chips to leave the hole. It is also recommended for tough, soft, and other "stringy" materials such as nickel, stainless, copper, and aluminum alloys; also for certain plastics. Spiral-fluted taps for cutting a right-hand thread should have a right-hand spiral of about the same helix angle as that used on an ordinary twist drill. Both bottoming threads and taper threads may be cut with this tap design.

Taps for fine threads in relatively large holes should have more than four lands. One land per ¼ in. of dia is a good general rule—with land width ½ of flute width. Taps such as these are special; not stock items.

Lubrication of spiral-fluted taps, in through holes, is sometimes more effective if applied as a pres-

sure stream from the bottom of the piece. The action of the spiral is to carry material up the flutes and out, and a lubricant applied at the top has difficulty reaching the cutting edges. Larger taps may have an oil hole drilled through the core.

## SPECIAL-PURPOSE TAPS

Literally thousands of designs have been produced to accomplish specific, non-routine, threading problems. Most of these designs are based on two principal factors—the unique requirements of the job, and the rules for obtaining maximum tapping efficiency.

Some designs are for special tools used so widely that manufacturers produce them as standard stock items. Pulley taps, tapper taps, staybolt taps, spindle staybolt taps, straight and taper boiler taps, and mud or washout taps are in this category. These may sometimes suit purposes other than their original intent.

**Staybolt taps** are used principally in boiler, locomotive, and railroad shops for tapping the staybolt holes in the inner and outer plates or shells of boilers. Distances between these shells vary, and the tap must have sufficient length to tap both holes in one operation so the threads in both holes will be in alignment and have the same lead.

**Spindle staybolt taps** find use largely in repair work for retapping staybolt holes. A sliding internal spindle having a tapered guide is provided to insure that both tapped holes are properly lined up. The first hole is tapped, then the spindle is removed, and a non-fluted thread section at the back of the tap guides threading of the second hole.

**Straight boiler taps** are simply a special class of hand taps. They all have 12 tpi and range in dia from ½-1½ in. A pilot is provided, ahead of the chamfered portion of the thread, to simplify starting.

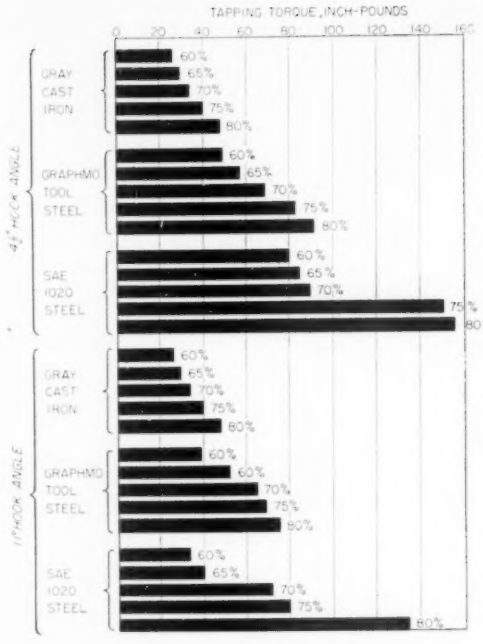
**Taper boiler taps** have no pilot and the threaded portion is tapered ¾ in. per ft. Over-all and shank dias are similar to those of straight boiler taps. Tap dia is measured ⅝ in. from the large dia of the thread.

**Acme thread taps** are usually made to special order as required.

## ORDERING SPECIAL TAPS

Blueprints, sketches, or samples of the tools to be duplicated should always be furnished when special taps are ordered. There are so many factors involved that the chance of error is greatly increased when the tap required is not a standard item. Even the latter must be ordered carefully. Blueprints and sketches should contain all of the following information, or, if B/P is not available, the details must be carefully listed.

1. Exact cutting size, tpi, and thread form. If multiple thread, number of starts wanted.
2. Right- or left-hand thread.
3. Style and design of tap—such as taper, plug, bottoming, serial, and hand, spiral point, nut, or tapper.




**Effect of thread depth (%)** on tapping torque is part of a series of tapping torque graphs prepared at Greenfield for a paper presented at ASTE 1951 Annual Meeting. A ⅜-16 NC HSS plug tap was used, tapping 9/16-in. stock at 60 sfpm, and using sulfur-base cutting oil. CI threading is only improved as regards actual thread depth cut; hook angles and tap styles make very little difference

4. High-speed or carbon steel.
5. Cut or ground threads.
6. If ground thread, class of fit required.
7. Over-all length; thread length; length, style, and dia of shank.
8. Number of flutes, if not standard, and whether straight, spiral, or spiral-pointed.
9. If spiral flutes, right- or left-hand spiral.
10. Length of thread to be cut.
11. Through or blind holes.
12. Hole size before tapping and depth of hole to be tapped.
13. Material to be threaded.
14. Taps to be used manually or by machine. If machine, what type.
15. Any special conditions of part design tap must meet.

## GROUND THREAD TAPS

Mass production has made it necessary to establish definite standard working tolerances for threading. These are divided into classes of fits, known as loose fit (Class 1), free fit (Class 2), medium fit (Class 3), tight fit (Class 4), and interference fit (Class 5). The latter is a more recent quasi-stand-

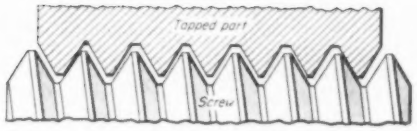
ard which now applies, primarily, to threaded studs.

Until thread fits were standardized, tapped threads were not expected to be accurate. Tap manufacturing difficulties made the maintenance of tolerances on close fits almost impossible. Lead errors, caused by distortion in hardening, were the most serious fault.

Improved heat-treating methods reduced these lead-error difficulties considerably as time went on. However, the ground thread tap has eliminated them by the simple expedient of grinding the lead after the blank is hardened.

Almost all ground-thread taps are high-speed steel and are made in two classes of accuracy—commercial ground thread and precision ground. Both grades have a lead tolerance of ± 0.0005 in., and the difference is that the commercial group ranges between 0.001- and 0.002-in. tolerance on the PD, depending on the PD, while precision-ground taps are held within 0.0005-in. tolerance on the PD. By comparison, cut thread taps have an average lead tolerance of ± 0.003 in.

Precision-ground taps usually are classified in a number of optional PD limit zones to meet various thread specifications. For example, some manufacturers provide them in basic PD to basic minus 0.0005 in., basic PD to basic plus 0.0005 in., and basic plus 0.0005 in. to basic plus 0.0010 in.




**Lead error** in the tapped part is shown in this profile. Error is caused by hardening tap after cutting helix. Tap threads ground into a hardened blank minimize this problem. However, modern tap production methods hold relatively close lead tolerances for cut threads as well

Fundamentally, the ground-thread tap is intended for threading to close tolerances which cannot be held by conventional cut-thread taps. However, their clean, accurate, thread form is so much more efficient that it will often prove economical to use them for less-demanding production operations.

# USE THE TAP CORRECTLY

Tapping may be done manually or by machine. In either case the rules must be followed exactly if an effective thread is to be cut. Neither method is routine. Both vary in technique according to the method used, the material to be threaded, and the tools available.

## HAND TAPPING

Freehand tapping is seldom the best way to produce an accurate thread. Although it is used widely, the thread could often be made better by machine or, at least, with a hand tapping machine. Only maintenance tapping or retapping; hole locations difficult to reach; and parts which cannot be brought economically to a machine, should be tapped freehand.

The axial centerline of the tap must follow the axial centerline of the hole. Relatively few mechanics can maintain this condition repeatedly without permitting side pressure on the tap. When this occurs, the hole becomes bellmouthed or the thread is cut oversize. Also, it is difficult to determine, time after time, the proper downward pressure for starting the tap and the safe amount of turning pressure to cut efficiently without breaking the tap.

Most taps are centered in the shank. This center hole should be used as frequently as possible when hand tapping. Almost any machine tool that provides a center and an adjustable holding device may be used. Latne, drillpress, milling machine, jig borer or even a plain grinder, will provide a means for centering. The tap is mounted in a regular hand tap wrench, a center is placed in the machine—either tailstock or spindle—and then the part is mounted on the chuck, faceplate, or table, until the center is true with the hole to be tapped. Following this, the center is backed out, the tap placed in the hole, and the center engaged with the center hole in the tap shank. Then, with light pressure, the tap is started. If a lathe, or other horizontal device, is used, be careful that the overhanging weight of tap and holder do not cut the thread oversize. Either the tap or the workholder may be rotated. However, rotating the tap usually provides better "feel."

It is only a short step from hand threading, using a machine for centering, to machine threading. By adding a tap-holding device which will permit the tap to lead itself, and placing this into the spindle or tailstock, the machine can be used for threading.

## MACHINE THREADING

Successful machine tapping is influenced markedly by the style of machine available, its mechanical condition, its adaptability, and its limitations. For instance, the choice between carbon-steel and HSS steel taps is a function of machine speed and power.

Some points to consider, in ascertaining that the best possible tapping conditions prevail, and that the cost per tapped hole is reduced to a minimum, are:

1. Is machine weight and size in proportion to the work and size of tap required? Light tapping is best accomplished on a light, fast machine, while a heavier machine is more suitable for heavier work.
2. Do machines used for a variety of tapping operations have sufficient range to provide recommended speeds for all sizes of taps required?
3. Sufficient machine power to provide uninterrupted

cutting during tapping? Many materials will work-harden at the chip interface the moment cutting hesitates; strain the tap.

4. Is the spindle in good condition and alignment; free to traverse without undue effort, yet fitted closely enough to exclude all vibration?

5. Is the spindle true (when tapping vertically) and perpendicular to the worktable within reasonably close tolerance?

6. Are machine ways (screw machine or turret lathe) in good condition and well lubricated to minimize load or drag? Are turret bed gibs sufficiently tight to prevent side motion? Do turret holes line up with spindle center?

7. Is reverse mechanism sufficiently sensitive to give instantaneous action? This is a frequent cause of tap breakage.

8. Are loose belts or broken gear teeth causing rough or uneven power transmission to spindle (and tap)?

9. Are the feed handles (on hand machines) of proper length for convenient operation? Excessive length leads to overloading of the tap, will not increase production, but can cause excessive lead error by deforming the threads. Too much leverage will often cause breakage.

10. Is machine spindle properly counterbalanced? When accessories such as chuck, friction mechanisms, and tapping attachment are added to the spindle, its weight is increased. This additional weight may not be sufficient to cause bad threads, but even a slight excess weight on the spindle may cause burnishing of one thread flank during reverse; thus cause the tap to cut oversize. This may also result in tap loading with soft, stringy material, particularly low carbon steel, brass, and nickel. **Check spindle balance—whenever thread is oversize or tap is loaded and no other good reason is apparent; also, whenever a heavy chuck or attachment is added to the spindle.**

Vertical machines are usually better for through-hole tapping, as chip disposal and workholding are easier than on some horizontal machines not designed specifically for tapping. Other than this, machine selection is strictly a matter of using the machine with equipment best suited to the particular job. Then keep it in repair and adjustment so its influence on the job is only that of rotating the tap.

## HOLE PREPARATION

**The tap is not a corrective device for poorly drilled holes.** That is one of the important things to remember in tapping. Actually there are only two important things to know about the holes you plan to thread: **depth** and **diameter.** But these are very important. Too often, because tapping is done after drilling, drillers overlook the importance of their operation in terms of the tapping operation that follows.

Again, there are two varieties of holes: open or through, and blind or bottoming. Through holes are more readily tapped than blind, as they permit using the spiral-pointed or plug tap. Blind holes can be threaded efficiently only when plenty of clearance is provided at the bottom.

In all cases and in all types of holes, good clean drilling and a reasonable degree of size maintenance will ease considerably the tapping of good threads, will improve size control, minimize loading of tap threads, and will reduce the strain on the tap. All of these mean greater tap life and more threads per grind.

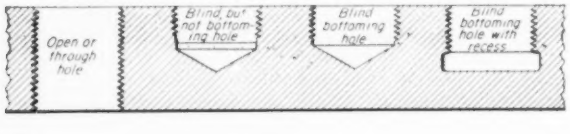
Drills should be ground evenly and carefully, preferably in a fixture rather than freehand. Lips must take an even bite and leave the hole walls smooth. A drill that cuts unevenly may distort the hole or cut an oval hole; thus cause uneven tap loading. Coolant should be used, when applicable, to prevent overheating the metal in the area to be threaded.

Holes for taper thread tapping should be bored or reamed taper before tapping. Every tooth cuts on a taper-thread tap, hence the load gets progressively heavier as the tapping progresses. If the hole is reamed with a standard taper pipe reamer, before threading, the tap will be required to cut only the full thread depth.

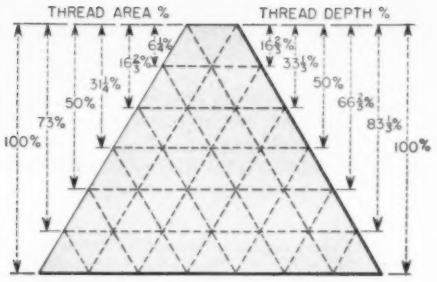
"Go" and "Not Go" plug gages, or at least a set of standard drill blanks (hardened), are a valuable investment. Holes drilled to these controls bring you one big step further toward better threading.

A drilled hole should be of sufficient diameter to produce a thread depth of approximately 75%. Most tap-drill tables are based on this premise. Adoption of this 75% depth was based on two reasons: lower power consumption and less tapping trouble. It has been proved that in tapping a full, or 100%, thread depth, three times more power is necessary than for a 75% depth, but the full thread is only 5% stronger.

This 75% is only an overage. Actually the percentage may vary from 50-53% for small or deep holes, to a maximum of 83 1/3% on any size. A




**Drilled or cored holes** for tapping are best if they are open. A blind bottoming hole is most troublesome; should be avoided wherever possible. If the hole must be blind, at least avoid having it bottom. The best blind bottoming hole provides sufficient recess to prevent tap jamming, yet permitting a complete thread




**THREAD AREA VS THREAD DEPTH (%)**

**Full threads are seldom necessary** for adequate assembly strength. 75% thread depth is usually plenty. As the thread depth is decreased it effects a still greater decrease in thread area. Hence, a decrease in thread depth effects a still greater drop in the amount of material the tap must remove, which, in the case of coarse pitch or short chamfer taps, is a very favorable condition

definite thread depth for all sizes, under all conditions, is not practical. The tap user must determine which is most suitable for his own requirements. By analyzing the following conditions, the problem is easily solved:

1. Diameter and pitch of tapped hole
2. Nature of material being tapped
3. Depth of tapped hole

**Has the required tap a fine or a coarse pitch in relation to its size?** The coarser the pitch, the smaller the thread depth should be. Try the 75% depth first. If tap breakage results, reduce the thread depth gradually until satisfactory performance is obtained. This is not likely to jeopardize thread strength. Remember that a nut with only 50% thread depth will break the bolt before its strips the thread.

Threads are "standardized" in two series, coarse and fine, but, as a tap size becomes smaller, the percentage of double-thread depth in relation to basic major diameter becomes larger.

| BASIC MAJOR DIA | NC | NF |
|---|---|---|
| 1.0 in. | 16% | 9% |
| 0.750 in. | 17% | 11% |
| 0.500 in. | 20% | 13% |
| 0.375 in. | 22% | 14% |
| 0.250 in. | 26% | 19% |
| No. 5 mach. screw | 32% | 26% |

**What material are you planning to tap?** Soft, stringy, metals such as copper, drawn aluminum, monel metal, nickel silver, and some other low-melting-point alloys, because of their malleable nature, have a tendency to flow toward the crest of the minor diameter while being tapped. The minor diameter of tapped holes in such materials will be smaller after tapping. Take this into consideration when selecting tap-drill size.

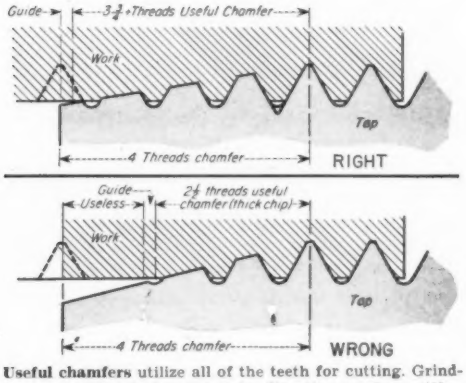
Materials that are very tough or of high hardness can be tapped more successfully with less than the normal 75% thread depth. Use the smallest thread depth possible for these.

**How deep is the hole to be tapped?** Larger tap drills may be used when holes are deeper than 1½ times tap dia, particularly when using machine-screw sizes. Drills which will give a 50% depth are found to be entirely satisfactory.

Punched holes often cause binding or loading, and tap breakage, especially in thin sheet metal which creates an "oil-can" effect. When the hole is punched, the metal is flared out. As the tap is reversed after threading it draws in this flare and binds. This should be considered when selecting punch size. Of course, the larger the punched hole, the less tendency for the tap to load.

Cored holes in castings and forged holes in forgings should be checked for this 75% depth, and reamed to size if necessary.

# RESHARPENING SOLID TAPS




**Useful chamfers** utilize all of the teeth for cutting. Grinding a chamfer below the hole diameter wastes cutting teeth; does not ease the cutting load

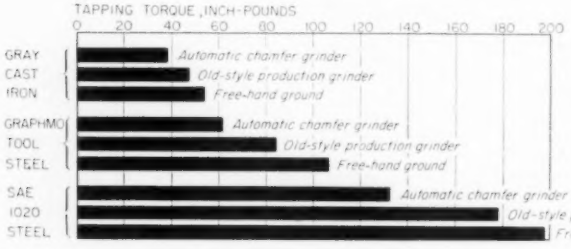
Dull taps cut much harder and require more power to drive; will often slow down the tapping machine. In soft materials they may force the thread oversize, particularly if the thread is in a boss.

Resharpening is usually done at the tap chamfer, or point, only, using the periphery or side of a grinding wheel. Freehand grinding is often done, but should be avoided if at all possible. It tends to produce an uneven grind, and usually results in the teeth of one or two lands carrying the entire burden. This strain on the tap will use additional power and cause excessive tap breakage. It may also cause the tap to cut oversize.

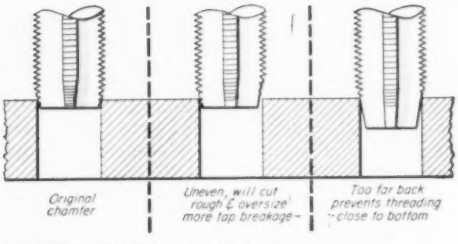
Taps should be resharpened on a good tap-grinding machine. This machine is practical for even a relatively small number of production taps. It reproduces the original grind accurately; provides a tap that cuts easier, is more accurate, and has longer

life. If this is not available, freehand grinding, though definitely not recommended, must be used. A soft 80-grit wheel is recommended, and it is a good idea to use a new tap as a sample. Note the number of threads chamfered, the angle, and the depth of eccentric relief back of the cutting edge.

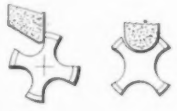
Occasionally, it is necessary to grind taps in the flutes to clean up the teeth or change the hook. This is most easily done by mounting the tap between centers in a universal tool grinder. The tap is prevented from turning by placing the back face of the land against a universal tooth rest. A hard, 60-grit, saucer or dish grinding wheel should be used when the cutting face to be ground is radial or has a straight rake. When the face is hooked, a straight disk grinding wheel is used, its periphery diamond dressed to suit the hook required. Accurate indexing must be maintained throughout.



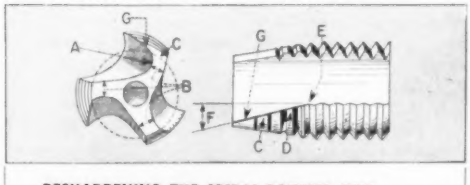

**Chamfer grinding method** in terms of tapping torque shows that precision chamfer grinding increases tool life considerably; freehand grinding invites breakage. (¾-16 NC HSS plug tap, 4½° hook angle, 75% thd depth, 9/16-in. stock at 60 sfpm using sulfur-base oil)




**Regrinding chamfer freehand** may result in the off-center cutting shown in the center sketch. Lefthand sketch shows the desired condition of uniform grinding, a centered tap, and even cutting. Righthand sketch shows tap evenly ground and centered but chamfered too far back. End must be cut off or the tap will not thread close to the hole bottom. Regrind cutting faces sparingly on relieved taps, particularly if relieved to the cutting edge, or tap will cut undersize. Concentric relieved taps permit several sharpenings as 1/3 of land width is true dia

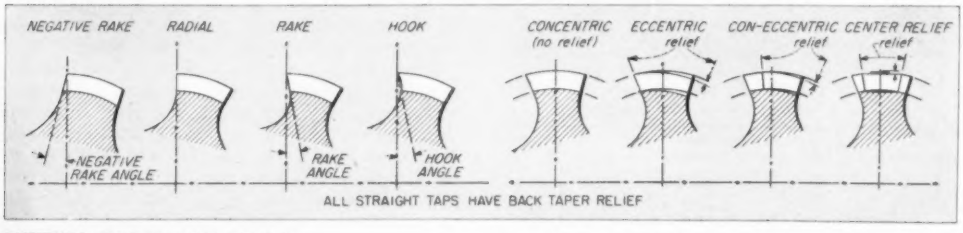


Regrinding cutting face grind sparingly on relieved taps




## RESHARPENING THE SPIRAL-POINTED TAP:

1. Use new tap for reference. Maintain, exactly, original form
2. Dress wheel to flute, maintaining form (G)
3. When land ends (B) become thin from repeated sharpening, grind tap end straight back until lands reach normal thickness. Reform flutes and cutting edges. Reform hook (G), while retaining straight cutting edge (A) and angle (F)
4. In regrinding chamfer (C) be sure to grind the relief, leaving cutting edge (A) highest—back away toward heel, (C) in end view
5. Maintain angle (F) for shear cut
6. Remove only sufficient metal to provide sharp cutting edge and retain original flute form
7. Maintain indexing.




## CUTTING FACES AND RELIEF...

**Negative rake**—Cutting face straight in front of radial line
**Radial**—Cutting face straight and lies in an axial plane
**Positive rake**—Cutting face straight in back of radial line
**Hook**—Cutting face curved. Establish hook angle by drawing chord between crest and root of thread
**Concentric**—(no relief other than back taper)
**Eccentric relief**—Continuous relief from cutting edge to heel
**Con-Eccentric relief**—Usually first 1/3 concentric; remainder relieved
**Center relief**—Concentric at cutting edge and heel; relieved at center. Used for tapping jobs where it is necessary to pass over a keyway or slot

Hand grinding of flutes should be done only if unavoidable, and then carefully to insure that the tap pass, as nearly as possible, beneath the wheel at right angles to the wheel-spindle axis. In all cases, plenty of coolant should be used and very light cuts taken, to prevent overheating the tap. Polishing the ground portion of the tap, after grinding, is always of value, but particularly if the teeth have a tendency to load.

Taps with broken teeth or threads need not be discarded, but the broken portion should be carefully ground out and smoothed. Depending upon material to be threaded, and the tolerances, taps are usable with up to 1/3 of their teeth removed.

Taper taps, for pipe or special threads, must be machine ground and correctly indexed to insure accurate spacing of the cutting faces and land heights uniform from axis to avoid tapping out-of-round.

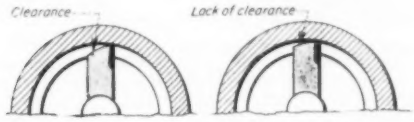
## COLLAPSIBLE TAPS

Solid taps are usually manufactured as stock items. Collapsible taps are also stocked, but a large percentage are designed specifically for the job to be done. They are designed with hob or radial, and circular chasers only. At present, the radial chaser has wider use. Circular chasers have greater tool life, but are limited to a larger-diameter hole.

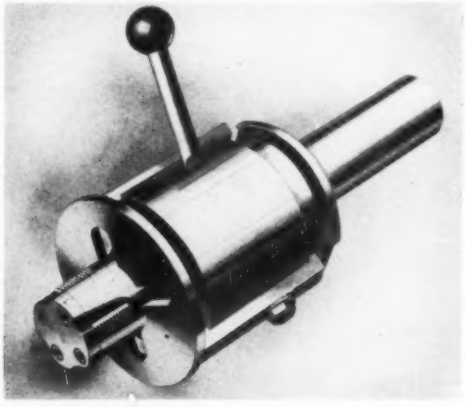
Both rotating and stationary collapsible taps are manufactured for application as needed—automatic machine or turret lathe. Universal models are also available which can be converted to serve as rotating or stationary taps.

**Radial chasers** have the lead in the chaser, hence when one is ground, all must be ground to exactly the same length.

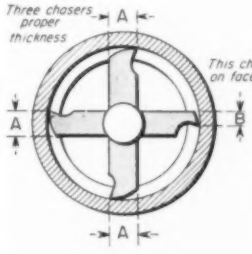
**Circular-chaser collapsible tap** with chasers mounted on holders and spaced non-rhythmically to prevent chatter which sometimes occurs with cutters or chaser mounted directly opposite each other. Tool shown produces long, smooth, taper threads of high precision to API standards for the petroleum industry. Chasers are adjustable for both diameter and wear



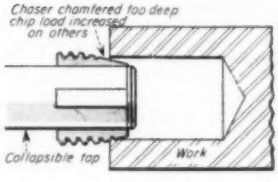

**Leadscrew**-controlled operation permits use of chaser with free cutting condition; minimum chaser wearback. Chaser used without leadscrew control is permitted only a minimum radial clearance. Tooth form is needed for leading



**Radial-chaser collapsible tap** of stationary style for use on hand screw machines and turret lathes, etc. After a thread is cut the chasers collapse into the body and the tap is withdrawn without reversing. This model may be readily converted to a rotating tap in automatic machines




**Chaser ground too thin** on face (B) will not cut; throws uneven load on other chasers. This will cause off-center cutting. All chasers must be ground, or adjusted, for even loading




**Chaser chamfered too deep;** is not cutting, or even starting, with the rest. Chip load is increased on the other chasers in the set. Result can be off-center threading or chaser breakage

**Circular chasers** have annular grooves and the helix angle is provided by the mounting block, therefore individual chasers may be ground and reset without touching the others in the series.

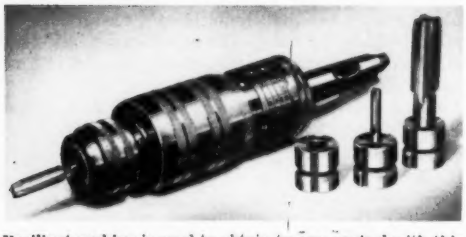
Collapsible taps are used according to the same rules as solid taps. These rules must often be followed more strictly with collapsible than with solid taps. All taps work best where tap and workpiece are carefully aligned. If this is impossible, plenty of parallel float should be provided.

Tap chasers are made to many different designs and in both straight and overhang styles. The latter style permits tapping to a shoulder or in a blind hole where the hole dia will not permit the tap nose to enter. Clearance is manufactured into a radial or hob tap chaser according to the material to be cut. When this is changed, the thread form must be changed too. Taper and straight threading collapsible taps are made, and one special design provides a cam-actuated tap for cutting a reverse taper.

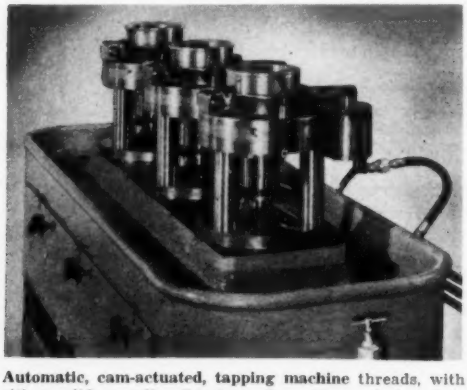
Sharpening of tap chasers is the same as for diehead chasers except that a right-hand diehead chaser is a left-hand tap chaser (*AM*, Mar. 5, '51, p 113). No chaser should ever be ground freehand. If a chaser grinder is not available, the sharpening may be done on a conventional surface grinder.

Centralized grinding is recommended, rather than having the operator resharpen the chasers. Some users have found that by so doing they have cut chaser costs by as much as 25%.

# TAPPING MACHINES AND ATTACHMENTS



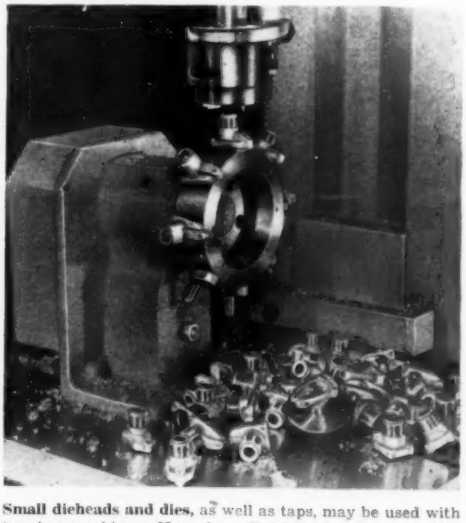
**Resilient cushion** is used to obtain torque control with this tapping attachment. High elastic limits permit sufficient torque for tapping; still allow enough "give" to allow friction disks to slip when tap bottoms, hits a hard spot, or binds. Setting is for hole dia, irrespective of material, and table on attachment provides the correct figure



**Automatic, cam-actuated, tapping machine** threads, with either solid or collapsible taps, from the workpiece bottom. The tap, fed by a lead cam, rises to the work, held by a special fixture, at the correct tapping speed. As tapping is completed and the tap is collapsing speed is changed by cam for facing and chamfering. With all operations complete, and the tap fully collapsed, the cam permits the head to clear the work and reset for the next cycle. The head continues to rotate because the collapsible tap eliminates the necessity for stopping or reversing

Production tapping means machine tapping. A wide variety of equipment is available to meet the many needs that this encompasses. Machines are built specifically for tapping, some, even more specifically for tapping special parts. In addition to tapping machines, there are also many attachments manufactured for use on standard machine-tools, such as drillpresses, and for production tapping devices.

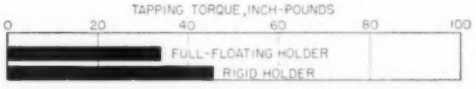
Tapping machines are manufactured in a variety of forms. These include general-purpose production units, portable machines, hand-held power tapping machines, and special-purpose machines, such as nut tappers, for high-production.



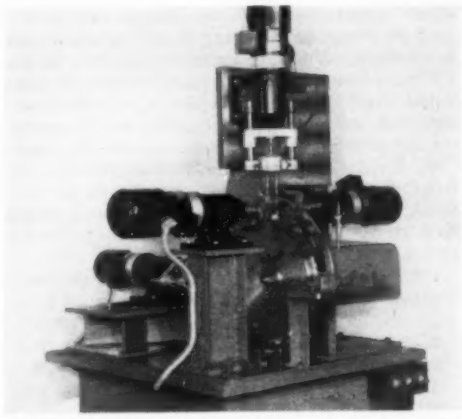
**Small dieheads and dies,** as well as taps, may be used with tapping machines. Here, in a dial indexing fixture, small parts, positioned on pins, are externally threaded just as simply as they could be tapped. Cycle time is improved by the self-opening diehead as stopping or reversing are unnecessary

General-purpose tapping machines are precision machines designed to meet the demands of efficient threading. They include sensitive devices which prevent tap breakage, precision depth control for blind-hole tapping, leadscrew feed, pressure lubrication, manual or automatic operation. Spindle tolerances are exacting. One series of tapping machines provides inverted threading. All operating mechanism is below the table. Tapping is done upward, therefore the chips are more easily cleared. It is also possible to face and chamfer the work along with the tapping cycle. Most tapping machines also permit external threading with button dies, acorn dies, or small dieheads.

Tapping attachments and portable power tapping units are extremely useful when production demand is not sufficient to justify a tapping machine, or for special production tapping setups. Most of these units operate on a friction-drive principle which is adjusted to slip if the motion of the tap meets any overloading interference. These units usually are designed to reverse at twice the speed used when tapping. Other styles of attachment utilize torque drive or gear drive to the tap, and still others have electrical or solenoid-actuated drive.

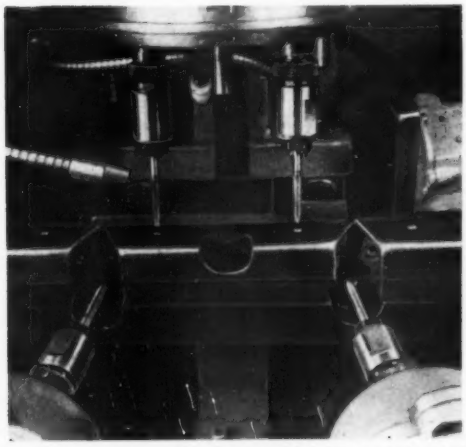



**Parallel float vs rigidity** has supporters on both sides. Some manufacturers think that float is necessary while others feel that workpiece and tap should be rigidly aligned. Actually, the decision rests with the individual job. If hole location relative to the tap is exact, float is unnecessary. But that is an ideal condition. This graph is based on CI. With a floating holder, required torque was reduced about 15 in.-lb



**Automatic tapping unit** is completely self-contained. Only electric power is needed for operation. It may be set up to operate alone or with a number of other units to operate simultaneously, in sequence, or interlocked on an indexing machine as shown. The spindle automatically feeds the tap into the work and, when required depth is reached, the spindle reverses and the tap withdraws automatically

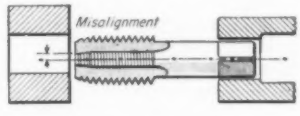
## FIXTURES FOR TAPPING

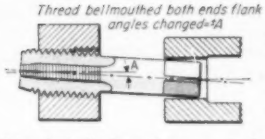


**Four holes are tapped simultaneously** in this sheet metal part. Fixture is a simple track with locating stops. Tapping action holds part in place during operation and lip at back of track prevents part from rising with tap during reverse

Machine tapping may be done with the workpiece hand-held, but accuracy and output are much improved if the part is held in a fixture.

Tapping fixtures should be designed for the job; are seldom fully efficient if "borrowed" from another operation. They must center the tool over the hole to be threaded, the tap must be controlled in direction all the way "home," and, although feed is a function of the thread lead, it must be protected




**Misalignment** between tap and workpiece will result in a bellmouthed thread at both ends of the hole. Parallel float will sometimes correct this, but it is not an out for sloppy setup. Sound threads and efficient tapping demand accurate centering initially. Float handles slight variations in hole location

from overloading or dragging. It is difficult, in some cases, to differentiate between tapping fixtures and tapping attachments. The tapping fixture may include the part that holds the tap, or taps, and it may be the workholder only.

Some fixtures incorporate a leadscrew to guide the tap, but most do not control this function. Leadscrew control is usually from the machine.

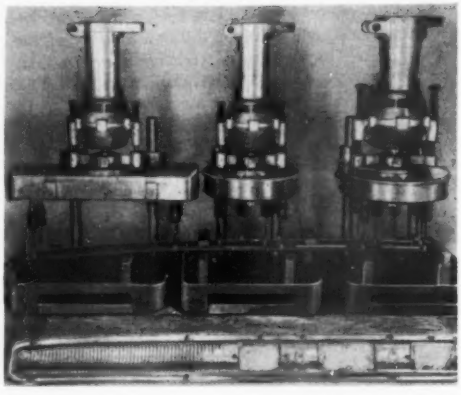
When designing a tapping fixture, it is important to avoid clamping the workpiece rigidly. By permitting a little "float" in the part, the tap can better center itself in the hole. If this is impossible, or if the work is heavy, the float should be provided by the tap-holder. Parallel float is particularly important when die castings are tapped. Without this freedom of movement, tough metals, out of alignment, will overload the tap; may cause breakage. Soft metals will permit the threads to be torn or cut oversize.

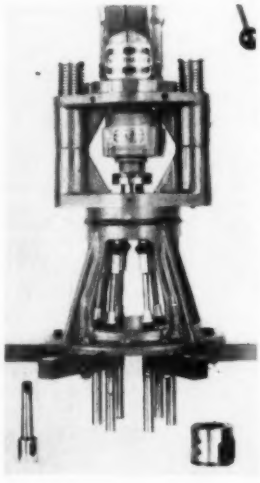
Parts may be held in position by a number of devices, such as:

1. Simple lip on fixture
2. Part holes located on pins
3. Part nested in fixture
4. Spring-loaded clamping
5. Magnetic chuck
6. Air, solenoid, or hydraulic holding

When the air, solenoid, or hydraulic holding methods are used, pressure should be controlled so the action is light. It is only necessary for a tapping fixture to position the part accurately, prevent it from turning during tapping, and to keep it from lifting with the tap during reverse. Light action may be obtained by placing a light spring between the piston and the clamping head. This will permit the necessary float. Rubber pads will often provide the desired give, also.

Production-wise fixtures are designed for hopper feed, rotary table-automatic indexing, trunnion handling, progressive tapping, and many other techniques. Method, here, is determined by production, part shape, previous operations, and equipment.





**Multiple-tapping head setup** to thread thin die-casting resembles die-set for stamping. Part is positioned accurately but held loosely to provide "float" for better alignment. Three smaller tapping fixtures are mounted on one solid steel plate, to maintain position

**Multiple-spindle tapping head** is used with a tapping attachment on a standard drillpress. Spindles may be positioned accurately, to a templet or layout, and locked in place. When attachments of this kind are used, drillpress spindle should be counterbalanced to maintain sensitivity, take load off taps

## TAPPING SPECIFIC MATERIALS

Regardless of the kind of material, three conditions must be present for a successful operation:

1. Correct tapping speed
2. Correct lubricant
3. Correct tap style and tooth form

If any one of these is incorrect, some phase of production will suffer; either quality, quantity, tool cost, or, all three. Unless each job is analyzed in terms of these, you can expect something less than an ideal result, regardless of how much effort you have put in to the other phases of tooling up.

### *Tapping Speeds*

For tapping to be efficient, the proper speed must be used. Taps operate most effectively in specific circumstances at specific speeds. These are determined by the composition of the material to be threaded, the kind of steel from which the tap is made, and the design of both tap and tapping machine.

Generally speaking, taps are manufactured in three material grades: carbon steel, regular high speed steel, and surface-treated high-speed steel. A possible fourth is carbide, but little has been done in the way of quantity production of carbide taps. In the large tap, or chaser sizes, where they might be feasible, considerably higher than normal cutting speeds are made possible.

Surface-treated HSS taps have had a secondary hardening, or wear-resistance, treatment. This may consist of super-hardening, a hard chromium plate of 0.0001 to 0.0003 in., nitriding, shot-peening,

or some other special surface treatment to slow the effect of wear and abrasion. Treatments such as these make it possible to increase tapping speeds 10 to 20% over those for HSS.

Carbon-steel taps are not recommended for production tapping hard, tough, or abrasive materials. When hand tapping a finished tool-steel die, a newly sharpened carbon tap should be used, then resharpened before reuse. If the tap breaks in the die, it is much more easily removed than a HSS tap. A similar suggestion is that, prior to die tapping, tap hardness always be checked. If the tap is drawn to 55-58$R_c$, some tool life is lost, but the danger of breakage is greatly reduced.

Ground and polished HSS taps, whether surface treated or not, may be used at speeds of 5 to 20% higher than those recommended before polishing. In addition, polished flutes and teeth will produce cleaner, smoother threads and longer tool life.

### Lubricants for Tapping

Many tap users do not appreciate the importance of proper lubricants, or cutting fluids, in successful tapping practice. Summarized, these effects include: longer tap life, greater production, better size control, smoother and more accurate threads, and more efficient chip removal. However, there is no one lubricant that suits all requirements. Also, lubricants and "coolants" are often confused. Tapping almost always calls for a *lubricant;* very rarely for a coolant. A simple rule is: Light lubricants for light materials and, progressively through the range, to heavy lubricants for hard or heavy materials.

Lubricant should be forced into the hole under pressure, the amount of which is variable: determined by tapping method, hole depth, and tapping speed. An ideal condition is to have the steam enter the hole parallel to the tap axis, or at the smallest permissible angle. *Get the lubricant to the cutting portion of the tap, in volume and at all times.* Automatic lubrication should be timed so that it reaches the hole before the tap starts to cut. This is especially important if flow is shut off during reversal.

High-speed steel, when cold, is very brittle and will operate more efficiently when heated. HSS taps will operate more efficiently if lubricant is maintained at 68 to 92 F. Beware of using taps directly from cold storage room, or in the early morning if shop was without heat during the night.

Regular cleaning of lubricant, tanks, reservoirs, feed lines, pans, tables, and machines in general, is important for effective lubrication. Simply replacing old cutting fluids with new does not remove all the dirt. Dust, grit, metal particles, decomposed matter, and other undesirable materials which accumulate in the lubricant will shorten tap life and reduce thread quality.

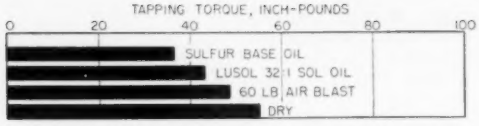
### Tapping Plastics

Plastic molding materials are generally abrasive, hence it is sound practice to use HSS taps which have had a secondary hardness treatment. Three-

## TAPPING SPEEDS AND LUBRICANTS

| MATERIAL | TAP SPEED, FPM: CARBON STEEL | REGULAR HSS | SURFACE-TREATED | LUBRICANT |
|---|---|---|---|---|
| Allegheny Metal | * | 15-25 | 20-30 | sulfur-base oil |
| Aluminum | 45-50 | 90-100 | 100-110 | kerosene and lard oil |
| Bakelite | * | 60-70 | 70-80 | dry |
| Brass | 45-50 | 90-100 | 100-110 | compound or light-base oil |
| Bronze | 20-30 | 40-60 | 50-70 | compound or light-base oil |
| Bronze-Manganese | * | 30-45 | 35-50 | light-base oil |
| Copper | 45-50 | 90-100 | 100-110 | light-base oil |
| Die Cast—Aluminum | 30-35 | 60-70 | 70-80 | kerosene and lard oil |
| Zinc | 30-35 | 60-70 | 70-80 | compound |
| Duralumin | 45-50 | 90-100 | 100-110 | compound or kerosene and lard oil |
| Fiber | * | 80-90 | 90-100 | dry |
| Iron-Cast | * | 70-80 | 80-90 | dry or compound |
| Malleable | * | 35-60 | 45-70 | compound or sulfur-base oil |
| Monel Metal | * | 20-25 | 25-30 | sulfur-base oil or kerosene and lard oil |
| Nickel Silver | * | 75-85 | 85-95 | sulfur-base oil or kerosene and lard oil |
| Rubber (Hard) | * | 80-90 | 90-100 | dry |
| Steel, Cast | * | 20-30 | 25-35 | sulfur-base oil |
| Chromium | * | 20-30 | 25-35 | sulfur-base oil |
| Machinery | 20-30 | 40-60 | 50-70 | compound, sulfur-base oil or kerosene and paraffin |
| Manganese | * | 10-15 | 15-20 | compound, sulfur-base oil or kerosene and paraffin |
| Molybdenum | * | 20-30 | 25-35 | sulfur base oil |
| Nickel | * | 25-35 | 30-40 | sulfur base oil |
| Stainless | * | 15-25 | 20-30 | sulfur base oil |
| Tool | 15-20 | 25-35 | 30-40 | sulfur base oil or kerosene and lard oil |
| Tungsten | * | 20-30 | 25-35 | sulfur base oil |
| Vanadium | * | 25-35 | 30-40 | sulfur base oil |

* Carbon-steel taps are not recommended for these materials




**Lubricants vs coolants** torque test using a ⅜-16 HSS plug hand tap with 4½° hook; tapping 9/16-in. CI stock, 75% thread depth, at 60 sfpm shows a surprising result. Although it is usually recommended that CI be tapped dry, use of a heavy lubricant provided the lowest torque. However, the variation is so slight that the gain may not offset added cleaning operations

fluted taps are preferred over 4-fluted ones. It is sometimes advisable to have negative rake on the back edge of the land.

Taps 0.002 to 0.005 in. oversize will produce more parts per tap. A 6-32 screw dia is 0.138 in. Tap dia is 0.1395 in. min to 0.1415 in. max. A tap made to the min dia will wear out in an average of 400 holes. If this dia is increased by 0.005 in., the tap will last for 1200 holes.

A thread depth of 65 to 75% is ample for phenolics, and the peripheral speed should be 50 to 80 sfpm. Cutting should be done dry, but with an air blast concentrated on the tap to clear chips and keep the work cool.

### *Tapping Monel Metal*

**Use HSS tap, preferably spiral pointed, with long chamfer.**

Hot-rolled Monel is, basically, a difficult metal to machine. Chips come out "stringy" and "curly"; are difficult to break up. Frequently the chips are friction-welded to the tool. This may cause the tool to load and break. Thread specifications should aim at reducing the machining problem.

Lubricant should be a high-grade sulfurized fatty mineral oil. Spindle speed should be 20-25 sfpm, but work toward highest speed that will produce good threads. Slow speeds tend to increase the difficulties.

Tap hook should be a minimum of 15° average; larger for smaller sizes. Thread depth should be minimum permissible to ease cutting load. In operation, avoid "backing-out"; if this is impossible, or hole is bottoming, provide plenty of cutting-edge relief so the chance of binding is minimized. Try interrupted thread design.

### *Tapping Cast and Malleable Iron*

**Use HSS surface-treated taps: dry or very light oil.**

Chips are no problem with either of these as the chip is very fine; does not bind the tap. However, where deep, blind holes must be tapped close to the bottom, clean out the chips frequently to prevent packing at the bottom.

Use a cutting face which has 0 to 3° positive rake. 4-flute taps are usually satisfactory, except in the case of deep bottoming holes, where 3-flute taps provide additional chip clearance.

### *Tapping Copper Alloys, Brass, Bronze*

**Use HSS or carbon tap, depending on production.**

The percentage of copper in the alloy has considerable influence on its tapping qualities. Before tapping, check this percentage.

Brass is free machining when copper averages 60%. Taps should have narrow lands, short chamfer, and a negative rake of about 3° on the cutting edge for best results. As copper content increases considerably the alloy becomes tougher and more ductile. For this condition, the tap cutting edge should be hooked.

Bronze is more difficult to tap; will require a hook of about 6°. If zinc or lead are added to the alloy, however, machinability improves and this hook may be reduced.

Remember that *the more brittle the alloy, the less hook on the tap.* Ductile alloys tap best with positive hook, spiral-pointed taps.

### *Tapping Aluminum Alloys*

**Use HSS, surface treated, spiral-point or spiral-flute taps.**

Aluminum is in the ductile "stringy" class. Taps should have narrow lands and 10° to 20° rake at the cutting edge. Ground-and-polished-thread taps are recommended.

Lubricant should be a mixture of kerosene and lard oil.

### *Tapping Steel Forgings*

**Use HSS, ground-thread taps, preferably spiral-point.**

Cutting speed must be reduced from that used on free-machining steels. Rake at cutting edge should be 10 to 20° and, where tap is reversed and backed out, a clearance rake on the heel of the land will minimize binding. A specially designed tap may be necessary for best production threading.

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## WE APPRECIATE...

*the valuable contributions to BETTER TAPPING provided by the following firms and organizations:*

Aluminum Company of America
Amer. Inst. of Bolt, Nut, & Rivet Mfrs.
B. C. Ames Co.
John Bath & Co.
Bay State Tap & Die Co.
Charles R. Besly & Co.
Bridgeport Brass Co.
Brown & Sharpe Mfg. Co.
Cleveland Tapping Machine Co.
Dorman Machine Tool Works
Eastern Machine Screw Corp.
Errington Mechanical Lab., Inc.
Ettco Tool Co.
General Electric Co.
Geometric Tool Co., GTD
Greenfield Tap & Die Corp.
Govro-Nelson Co.
Hanson-Whitney Co.
Hy-Pro Tool Co.
International Nickel Co., Inc.
The Charles L. Jarvis Co.
Jones & Lamson Machine Co.
Landis Machine Co.
Lassy Tool Co.
Leland-Gifford Co.
Modern Tool Works, Consolidated
Morse Twist Drill & Mach. Div.
The National Acme Co.
National Machinery Co.
Pratt & Whitney, Small Tools Div.
Procunier Safety Chuck Co.
D. H. Prutton Machine & Tool Co.
Revere Copper & Brass, Inc.
Reynolds Metals Co.
Murchey Div., The Sheffield Corp.
Snow Manufacturing Co.
Threadwell Tap & Die Corp.
Thriftmaster Products
Tinker's Thread Grinder Co.
Union Twist Drill Co.
The Warner & Swasey Co.
Winter Bros. Co.
The Wickman Mfg. Co.
Woodruff & Stokes

Special thanks are due *Greenfield Tap & Die Corp.*, Greenfield, Mass., for the helpful material they have provided for our "Threaducation" program


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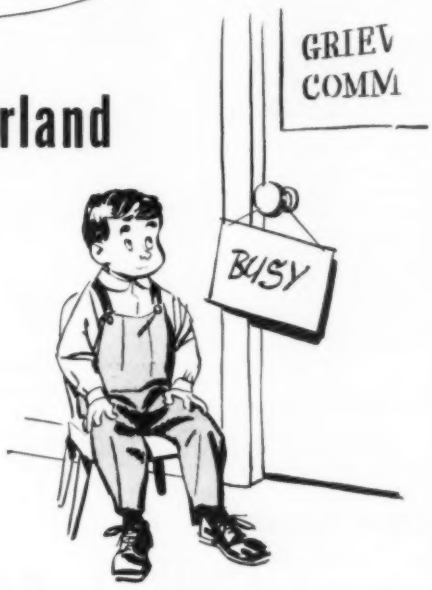
# ROUND TABLE

## Alice in Blunderland




"Why the storm clouds, Ed? You look like somebody really rubbed your fur the wrong way!"

"Somebody did—that guy Reynolds. He went to that new-fangled management-labor grievance committee—says I owe him a raise, because he does all the sloppy, tough jobs."

"Well, it's good somebody is making use of that new committee—hasn't had anything to show for itself, up to now."

"Why do I have to be the goat the first time up? And who ever heard of a machinist being invited to go over his boss' head? He never told me he thought he was being picked on. I give him the tough jobs because he's good at 'em, and I already pay him as much as any man in the shop."

"He isn't going over your head, Ed, just getting some other points of view. Besides, you get your chance to tell your side—it's not like going over your head or doing anything behind your back."

"Still and all, it makes me look like a bum boss, and I don't like it. We could have worked it out between us—but Reynolds said he'd tried to talk to me about it and couldn't. I've been the guy who was supposed to find out gripes—what they now call grievances—but now I'm just the guy who hands out work."

"No, you're not, Ed. You can get help from the committee just as quickly as Reynolds or anybody else. It is tough, sometimes, to talk to your own boss—and if you did decide in his favor, you'd still have to get higher OK for any raise. This way, the committee backs you up on a raise request if they agree it's right."

"Yeah, whether I think it's right or not! Nuts. I want to run my own show, as I've said before. We never had much trouble before."

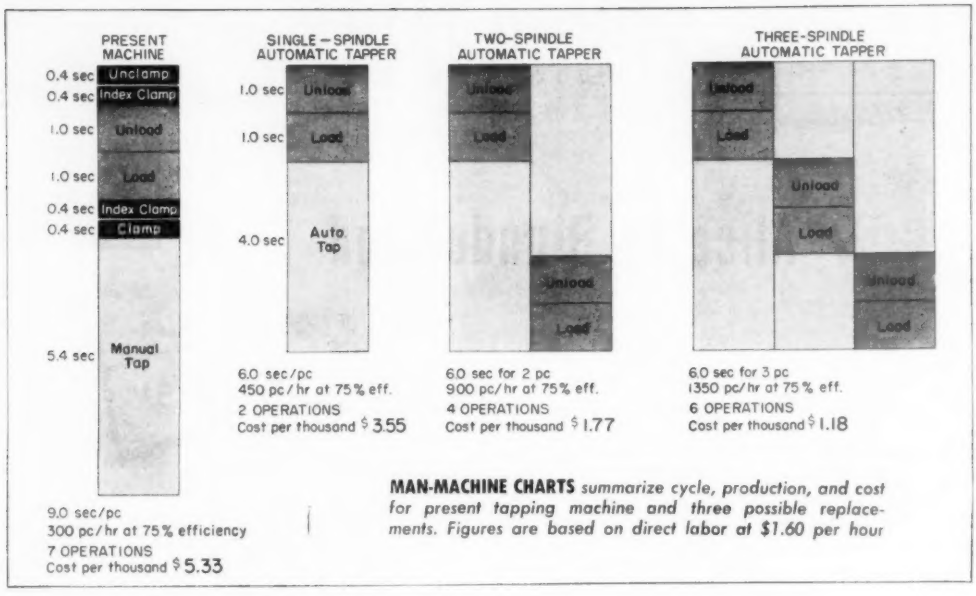
"But companies are worrying more about morale now, Ed. It's not like 'Alice in Wonderland' where they had the verdict first, the trial afterward. Nowadays, companies watch all along the line and handle any little trouble before it grows big."

"Why can't they let the foremen handle 'em? Why does some Mad Hatter from the front office have to butt in?"

"Look, it's a lot better to deal with a grievance committee of men who know what it's all about, rather than with a personnel man or a union steward—who probably doesn't."

"I'd still rather be my own grievance committee. If Reynolds gets his way in this, he will think that he has to go running to court with every little gripe. Then where does my authority go, Al? Remember what Boss Ket said when he heard Lindbergh had flown across the Atlantic alone? He said, 'It would have been a lot more wonderful if he'd done it with a committee.' . . ."

***IS THE MANAGEMENT-WORKER GRIEVANCE COMMITTEE** a sound method? What about a personnel man vs the foreman? Your ideas and opinions on this subject will interest others. Discussions of earlier topics appear on later pages.*




**MAN-MACHINE CHARTS** *summarize cycle, production, and cost for present tapping machine and three possible replacements. Figures are based on direct labor at $1.60 per hour*

***Case History:***

# ANNUAL CAPITAL RETURN ON NEW MACHINE IS 150%

**An actual case history of how man-machine charts sold a tapping machine after earlier attempts to sell it had failed**

BY HARVEY E. HALLENBERG
Sales Manager
THE E. L. ESSLEY MACHINERY CO.

HERE'S how the Man-Machine Charts presented to the students at a Sales Engineering Refresher Course sponsored jointly by The National Machine Tool Builders and The National Machinery Dealers Associations were instrumental in closing a sale.

The charts were originally designed and intended to illustrate time and motion studies as related to production where efficiency was of primary importance. They came into being when our modern high-production methods necessitated reduced piece handling and the continued flow of products from the rough state to the finished product.

All machine-tool sales proposals cannot use this approach but most production-machine proposals can. It is absolutely necessary, however, that complete information be obtained on the present methods and production times. They could also be used to great advantage in production control.

The customer was using a single-spindle, manually operated, mechanically reversing machine equipped with a multiple-spindle head. The operations were to tap two No. 10-32 and three No. 8-32 holes. Because this machine was not leadscrew fed, it was necessary to clamp the part so it would not hang on the taps—which it would do if the operator did not "feel" the taps in and out of the work. The man-machine chart for this machine shows the seven operations necessary on this machine, the time required for each, and the production.

Originally proposed as a replacement machine was a single-spindle, leadscrew-fed machine, automatically controlled through solenoids, equipped with a 6-spindle head, one spindle operating the leadscrew.

In spite of the advantages of increased production made possible by close control of the required spindle travel, and more efficient

## WORK SHEET

The Cost of the New Machine is $ 9,235.00

| | OLD MACHINE | NEW MACHINE |
|---|---|---|
| Direct labor cost per hour | $ 1.60 | $ 1.60 |
| Fringe benefits per hour (see page 3) 30% | $ .48 | $ .48 |
| Total hourly labor cost per hour | $ 2.08 | $ 2.08 |
| Divided by the number of parts produced per hour-units | ( 300 ) | ( 1350 ) |
| Gives us total labor cost per piece | $ .00693 | $ .00154 |
| The new machine produces 10,800 pieces per day | | |
| At $ 0.00693 per piece on old machines they would cost | | $ 74.84 |
| At $ 0.00154 per piece on new machines they would cost | | $ 16.63 |
| Labor savings per day | | $ 58.21 |
| Annual savings, labor (40-hour week, 50 weeks per year) | | $14,552.50 |
| Estimated additional savings per year (see page 4) | | $ 450.00 |
| Total Annual Savings | | $15,002.50 |
| Desirable annual rate of recovery of capital invested in the new machine assuming it has a 10-year* profitable life (1/10 of cost) | | $ 923.50 |
| Amount recovered annually tax-free by 20-year* depreciation schedule (½ of above) | | $ 461.75 |
| Additional amount to be recovered annually out of profit | | $ 461.75 |
| Earnings required annually before taxes (at 38%) to recover above amount (above figure divided by .62) | | $ 637.22 |
| Annual capital recovery required over the 10-year period; $ 461.75 from depreciation plus $ 637.22 from profit before taxes | | $ 1,098.97 |
| Total annual savings | | $15,002.50 |
| Required annually for recovery of capital | | $ 1,098.97 |
| Annual net return on investment | | $13,903.53 |
| Rate of annual return on capital invested; annual net return of $ 13,903.75 divided by $ 9,235.00, the cost of the new machine | | 150 % |

* These periods vary, of course, depending on the nature of the machine and the product.

**ANNUAL CAPITAL RETURN** *from purchase of 3-spindle machine is computed on work sheet from the bulletin "Computing Return from Invested Capital"*

operation, the customer refused to purchase this machine. The author was familiar with this question in the shop, knew the customer needed the machine, and set about to prove it with the man-machine charts.

These charts compare the customer's old machine, new single-spindle, 2-spindle, and 3-spindle machines. The 3-spindle machine was subsequently ordered. This comparison indicates the advantages of buying the 3-spindle machine. Standard graph paper was used to make up the chart, with each division representing 1/5th sec.

Comparative cost figures are based on direct-labor costs only. This chart was submitted with a revised quotation on the 3-spindle machine and the order was placed.

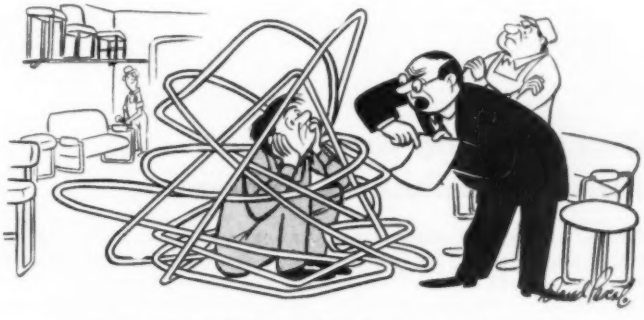
Subsequently, this problem was worked out on the work sheet that is a part of the bulletin, "Computing Returns On Invested Capital," published by The National Machine Tool Builders Association. This chart shows that in this case the total annual savings are $15,002.50. The annual capital recovery required is $1,098.97 (including income taxes on the portion not tax-free) for a 10-year life. Thus the net return is $13,903.53, or 150% on a $9,235 machine.

But suppose the user had not been able to handle a production of 10,800 pieces a day (the amount on which the work sheet is based). It is easy to adapt the work sheet for any anticipated production.

If daily requirements were only 5,400 pieces, the new 3-spindle tapper would be used only 4 hours a day at 75% efficiency. The annual savings would be reduced to $7,501.25. Annual capital recovery required would still be $1,098.97, leaving a net of $6,402.28 per year, for a return on capital invested in the machine of 60%.

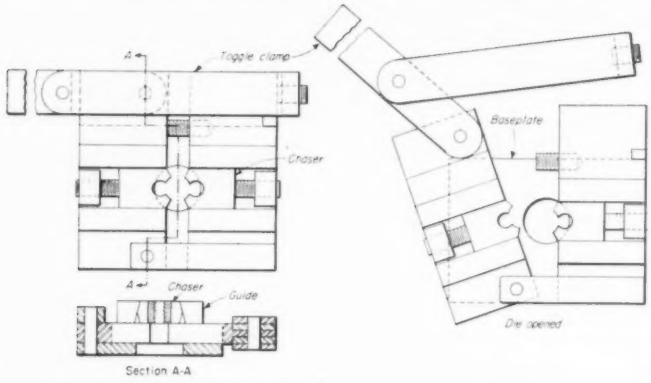
An even worse situation would be that in which only 2400 pieces were required daily (the present 8-hour production of the manual tapper). The new machine would be operated less than two hours a day.

Even with such limited use, it remains a good investment. The total annual savings are $3,232.50 for labor alone, not including any additional savings. Capital recovery required per year is still $1,098.97. The net return is now $2,133.53 or 23% on the $9,235 investment. This is small compared to the 150% obtained by making maximum use of the new machine, but it is still a handsome return on the investment and would justify the purchase.



*"Your personnel application here claims five years of experience . . ."*

# Practical Ideas

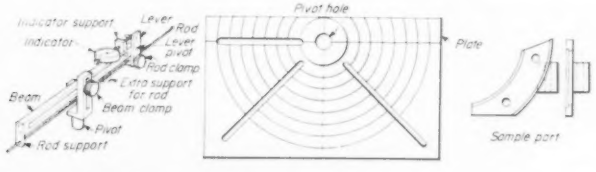



## Manual Threading Die Built Cheaply in Shop

FOR THE SMALL SHOP that cannot afford the luxury of self-opening threading dies, this design provides an inexpensive substitute. The chasers are adjustable commercial dies, which are arranged in the mechanism so they can be easily interchanged for different pitches or diameters.

Final details of construction have been omitted because we resorted to welding wherever possible, whereas many shops would prefer to dowel and screw the parts together. The guide plates on both jaws of the device must be taper-machined accurately and located to hold the chasers in the correct positions. The toggle clamp is arranged to grip the jaws together positively when the handle is down, and a stop screw is located between the jaws to provide correct spacing between the cutting edges.

The whole mechanism is built up on a baseplate that is drilled to clear any work to be threaded. All hinges and pins should fit closely. *W. W. Quist, Fargo, N. D.*




## Dial Checking Gage Inspects Radiused Components

SPECIAL GAGING REQUIREMENTS in a small machine shop are usually filled only roughly; often makeshift gages are used, and frequently accuracy suffers. In some cases the gaging and inspection on small lots takes more time than the fabricating. This inspection device is for cases where radiused workpieces must be inspected. The idea is adaptable to many kinds of work, many sizes, and can handle both concave and convex curves.

The baseplate is a smooth-machined piece fitted with three radial slots and scribed with circles for ready reference. The center hole is accurately drilled and reamed for the pivot pin of the gaging mechanism

The device includes an upright bracket, which is integral with the pivot pin, and a long beam fitted with a dial indicator. Both beam and bracket are slotted to allow adjustment of the beam up and down and from right to left. The beam clamp is a screw that goes through a square washer and grips a nut welded to the back end of the washer. The square washer fits through both the slot in the beam and the slot in the bracket to prevent the beam from tipping; thus keeps the device level with the baseplate.

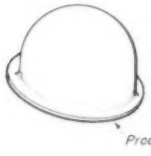
A simple drilled plate on the end of the beam supports one end of the measuring rod — a piece of small-diameter drill rod with rounded ends. The other end of the rod is supported by a yoke controlled by a screw and knurled nut to clamp the rod so it cannot move axially.

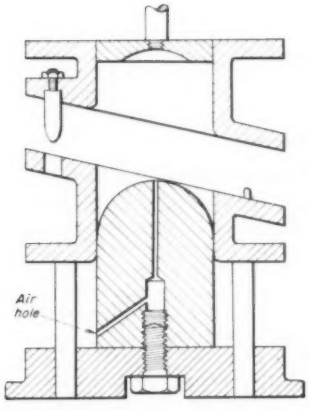
The rod clamp is supported by a vertical lever, which, in turn, is pivoted at the end of the beam. The dial indicator is mounted in a block attached to the top of the beam, and its spindle end contacts a plate attached to the upper side of the lever. The distance between the lever pivot and the axis of the indicator is the same as from the pivot to the axis of the rod, so the indicator is direct-reading.

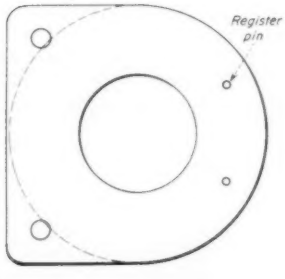
A setting block is mounted on the plate, attached in one of the slots, so the device can be set for a radius. The beam is aligned with the block, the rod is moved out to contact the block, and the rod clamp is tightened. This is done so the required radius will be the distance from the axis of the main pivot to the end of the rod. Then

the part is clamped on the plate in place of the block, and the beam is moved to make the rod's end follow the curve. For full sensitivity, the bearing area at the rod support should be lubricated.

For convex curves, an additional rod support is located closer to the dial-indicator end of the beam, and the part is mounted under the beam on the baseplate. *R. H. Fry, Surrey, England.*



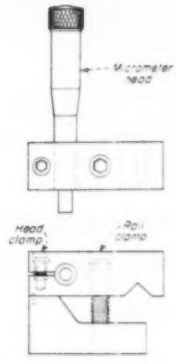

### Unusual Drawing Die Produces Slanted Hemisphere

THIS PART was originally produced in Germany with two draws, but when starting a run to produce it in our country, we decided to try to make the draw in one stage. Stock was 0.0315-in. sheet steel. The equipment was a 60-ton mechanical press with a pneumatic ram.

Only the basic parts of the die are shown. The die and pneumatic-powered ram were of good-quality steel. Stock was located in the slanted opening, the ram started down, the stock was drawn over the hemispheric die, and the ram formed the top of the part.

The die set was equipped with suitable pilot pins, an air-ejection system, and precision guide pins for the moving part of the die. The die works well, although we should have a larger press to maintain a higher rate of production. *Pierre Wilmus, Wavre, Belgium.*

**A CAN** of ordinary household vegetable shortening with a small brush can be kept handy on a surface grinder for when work over six in. square must be ground without liquid coolant. Applying some of this lard to the grinding wheel after dressing and before grinding tends to keep the wheel from loading, improve finish, and keep the wheel in shape longer. *E. Diskavich, Torrington, Conn.*




### Micrometer Stop Adds To Lathe Accuracy

I TOOK an old micrometer, unscrewed the spindle and cut off most of the frame, then fitted it into a squared block that gripped the stationary part of the caliper frame.

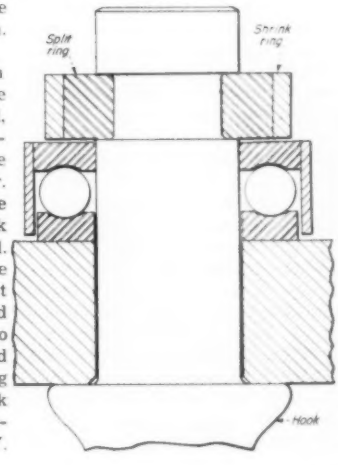
Then I made another squared and shaped block to match the first and to assemble to it with a pin and bolt. The result was a micrometer stop for my lathe which would attach to one of the ways of the machine. *William Lyga, Bristol, Conn.*

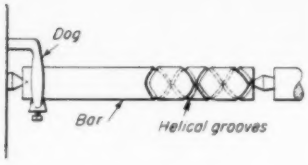
## Heavy Crane Hook Supported By Shop-Designed Bearing

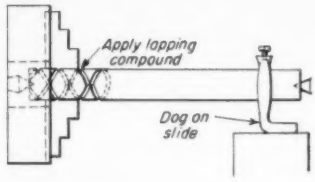
SOME TIME AGO we had to produce a heavy crane hook from 6-in. steel.

Two raceways, one having a slightly larger diameter than the other, were machined, hardened, and ground. A piece of stainless-steel tubing was forced over the larger raceway to provide a cover.

Because of the heavy load, we did not want to trust a hook shank that was assembled with a thread. We machined a groove near the end of the shank and fitted a split steel ring into this. Then we heated a seamless-tubing shrink ring to fit around this collar and slipped it into place. On cooling, the ring made a tight fit. The resulting hook assembly has been quite satisfactory. *B. A. Lee, Lockport, N. Y.*






## Lapping Method on Lathe Trues Jaws on Scroll Chuck

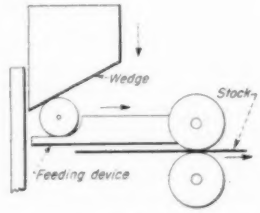
THERE ARE MANY WAYS of truing a three-jaw chuck, but almost all of them involve the use of the lathe carriage; thereby introducing any errors in the carriage, ways of the machine, and any additional equipment. It is impossible to get a perfect job this way if the lathe is old and worn. The method illustrated, however, eliminates the need for the carriage and makes the job accurate.

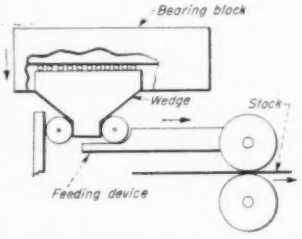
A hardened, true-running center is inserted in the headstock, and a bar of cold-rolled steel or cast iron is mounted between centers. This is turned true with no taper, and is cut so the OD is less than the ID of the hole through the chuck. Finally, a helical groove, 0.015 to 0.020 in. deep, is cut at the tail end of the work with one pass, forward and back. This is done with a slow speed and fast hand feed.

The setup is torn down, the chuck is mounted, and the bar is mounted between centers with the groove at the headstock end of the lathe. The dog is clamped at the tail end of the lathe with its end resting on the compound slide so it will not revolve.

Now, some coarse lapping compound is brushed on the area of the bar that will contact the jaws of the chuck, the jaws are tightened and the centers are adjusted so they prevent end play. Compound is added from time to time as the chuck revolves. The jaws are adjusted to light compression on the bar from time to time.

When examination shows that all the high spots on the jaw faces and any bell-mouth are removed, the job is done. Chucks that are in bad shape and have worn T-slots will run quite true after such a conditioning job. Once the lapping bar is made, it is easy to set up for another treatment. *Clarence B. Winch, Tonawanda, N. Y.*




### Improved Die Feed Has Longer Stroke

THIS IS A WAY of lengthening the feed stroke of a standard sheet-stock feeding device without making a complete new design. The idea doubles the effective stroke.

In the standard feed, a wedge cam comes down with the press ram to force a roller to the right, thus operating the mechanism to feed the stock. In the improved version, this wedge cam is replaced by a bearing block on the press ram and a double-side wedge cam with an extra roller. The action is the same, but as the block and wedge come down, the wedge is forced to the right by the stationary roller at the left, thus forcing the moving roller twice as far to the right.

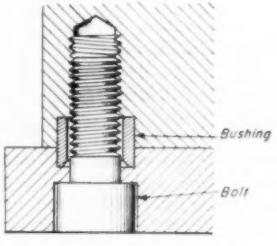
The bearing block is equipped with a needle bearing to take the sliding motion of the wedge, and suitable slots and tongues are provided to hold the wedge on the block. *Bernard Levowich, Brookline, Mass.*

**A VIOLINIST** isn't likely to have something valuable to teach a machinist; and yet I learned something from one when he was replacing the tailpiece gut on his fiddle. He expanded the ends of the gut with a flame to keep them from pulling through their holes. The same trick works fine to hold rawhide strips that lace together the ends of a leather belt for a machine drive. *Robert Roedder, Berwyn, Pa.*

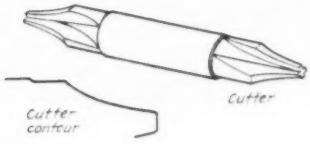
### Bushings Replace Locating Pins

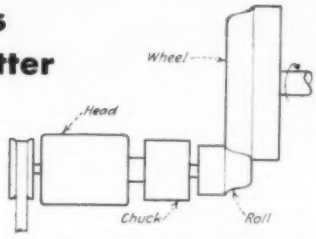
DOWEL PINS are conventionally employed for locating two parts exactly in relation to one another. Such parts or die members can as easily be located with small bushings when there is not enough space on the mating surfaces for pins.

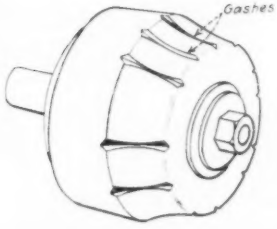
After the rough holes for the bolts that hold the parts together are drilled, these holes are counterbored accurately to take the bushings. The bushings are inserted, the parts are matched, and the bolts are inserted and tightened. The result is as accurate a fitting job as you can get with conventional pins. *A. Vetsch, Steffisburgh--Station, Switzerland.*



## Crushing Roll Forms Grinding Wheel Better



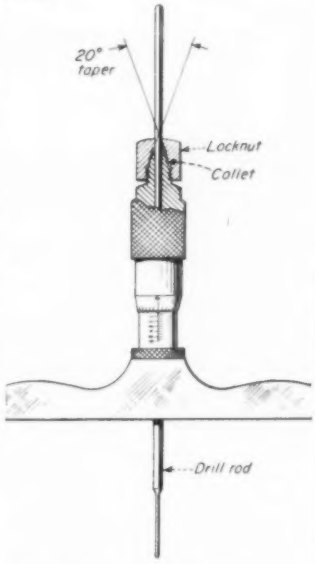




To PRODUCE special four-flute cutters that had two radii in their profiles, the old method was to use a 60-80-grit wheel which had to be dressed repeatedly with a diamond radius dresser. The work was checked on a 20-power profilometer, and accuracy was not satisfactory. After a changeover to a newer method that employed a crush-dressing system to true the radii on the grinder, production was quadrupled.

A forming roll was made from oil-hardened steel at 62-65 $R_c$. This was ground accurately to the required cutter shape, then was gashed at irregular intervals across the profile with a V-shaped grinding wheel.

The crushing roll is mounted in the chuck that normally carries the work. It is rotated at about 200 rpm, and drives the grinding wheel in reverse direction as it crushes into it. The wheel now used is a 100-150-grit wheel. Dressing only takes about five minutes.

A wire brush is used against the wheel as it is being crushed. This system opens up the wheel better so it does not glaze so rapidly on the job. *Chester S. Ricker, Detroit, Mich.*

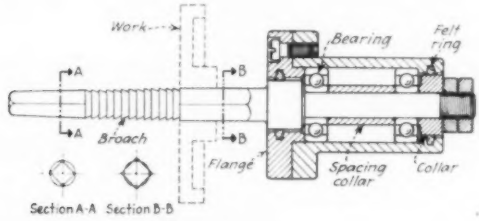



## Micrometer Depth Gage Has Adjustable Rod

A STANDARD depth micrometer can do universal depth gaging if the spindle is removed and an adjustable one is installed in place of it. The tool will then be handy for specialized measuring in the making of plastic molds and casting dies.

A taper-bored locknut and split collet are made to fit the barrel of the micrometer. The rod is a piece of hardened and ground 1/8-in. drill rod with the lower end ground down to a 1/64-in. dia to fit into small holes.

Naturally, this gage is not automatically adjustable—a set of gage blocks is utilized for making a setting of the rod—but it is quite handy nevertheless for normally tough measuring problems. *Fred H. Lingenfelder, Milwaukee, Wis.*

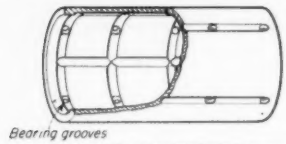


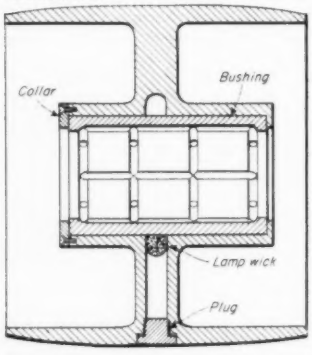

## Lathe Broach Holder Rotates With Work

BROACHING is often done on the lathe—for example, when a square hole must be cut through a round plate to take a square shaft—but the lathe is usually stopped when this operation is done. A tool has been made in our shop to allow light broaching operations while the lathe is running. This allows turning and facing operations to go on while broaching is done from the turret.

The broach holder is mounted in a turret holder, and is fitted with radial ball bearings to permit easy rotation. The holder is accurately machined, and is fitted with felt rings. The pilot at the front end of the broach is square in section, and has sharp edges which will catch at the edge of the work hole and will start the broach rotating as it begins cutting.

The important idea behind the device is the sharp edges, which start the broach rotating as soon as it contacts the work. *Nobuo Arakawa, Tokyo, Japan.*




## Floating Bushing Extends Pulley Life

ONE HIGH-SPEED PULLEY in our overhead transmission line used to give us constant trouble. We had to keep a spare on hand at all times, and had to replace the pulley every two weeks—which involved tearing down that section of the line. In addition, oiling was required twice a day, which was a costly and quite annoying proposition.

To replace this pulley we made one with a floating bushing that was held in the pulley bore by a collar. The bushing had four long grooves on its OD and four on its ID, and these grooves were equipped with lead-through holes that helped circulate lubricating oil. There were also four circumferential grooves around the ID of the bearing. A large hole in the web of the pulley acted as a reservoir. This was filled with a lamp wick, and was plugged with a screw so it would retain a large amount of oil, but would be easily accessible for refilling at any time.

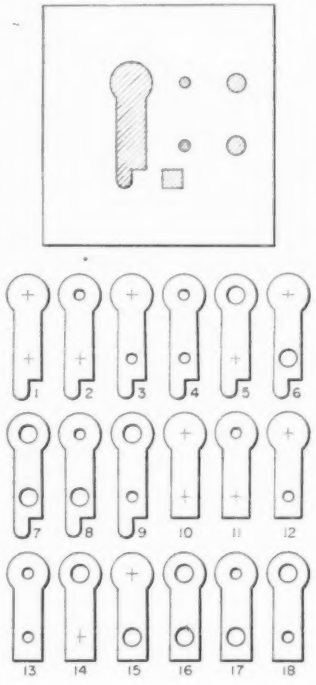
This did the trick. The new bushing and pulley have been in service over two years, and show no need for replacement yet. We fill the oil reservoir once a day to maintain lubrication. *Michael Axler, New York, N. Y.*

## Single Die Cuts 18 Different Blanks

DIES are usually single-purpose tools; they are made for the production of a single item, and cannot normally be used for others. Nevertheless, there are cases where dies are designed to serve in the manufacture of more than one part. This is an example of what can be done along this line if you are lucky enough to require a number of similar parts.

The illustrated die is a conventional progressive type, provided with a blank opening, four round piercing holes, and a rectangular punching hole. All parts of the die are easily made; only the stock stop must be carefully located to provide for accuracy.

By the simple subterfuge of installing or removing various punches, it is possible to obtain 18 different punched pieces, including two with no holes in them. *Federico Strasser, Santiago de Chile.*

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An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

**PAYMENT**—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

**JUDGES**—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

**REQUIREMENTS**—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards, and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

**WHO MAY ENTER**—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

**HOW TO ENTER**—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N.Y.

123rd Winner:
(For March 5 issue)
Tom Brown
Dentist's Burr
Trims Holes

Average diameter of a hole
Bearing race matching
Angle between bore and face
Diameter
Thickness
Bore center distance
Crank throw, eliminating all error due to diametral tolerance
Twist
Bend
Lobing or cloverleaf of a centerless ground shaft
Typical Dimensions and Relationships measured with Sheffield
PRECISIONAIRE GAGES
The range of dimensions and position relationships which can be measured quickly and precisely by Precisionaire Gages is almost limitless. In fact, some such measurements are possible otherwise only by elaborate auxiliary equipment in a well equipped laboratory to obtain the same degree of accuracy. Illustrated here are typical Precisionaire applications in which deviations have been exaggerated for greater clarity.
Precisionaires are the only gages which offer the combined advantages of greater linear scale length, amplifications of less than 1,000 up to more than 100,000 to 1, and instantaneous accurate reading regardless of the distance between the gaging element and the base instrument.
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SHEFFIELD
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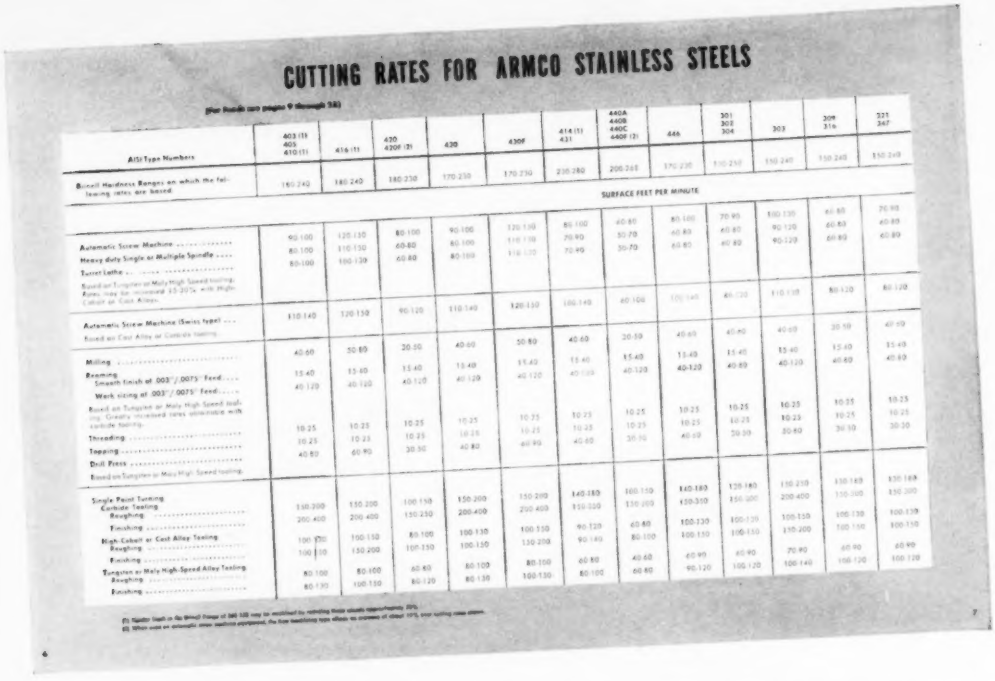
Flatness
Distance between hole centers eliminating all error caused by diametral tolerance
Center distance of incomplete holes eliminating all error caused by diametral tolerance



CUTTING RATES FOR ARMCO STAINLESS STEELS

| AISI Type Numbers | 403 (1) 405 410 (1) | 416 (1) | 420 420F (3) | 430 | 430F | 414 (1) 431 | 440A 440B 440C 440F (2) | 446 | 301 302 304 | 303 | 309 316 | 321 347 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brinell Hardness Ranges on which the following rates are based | 160-240 | 180-240 | 180-230 | 170-230 | 170-230 | 230-280 | 200-260 | 170-230 | 130-230 | 130-240 | 130-240 | 130-240 |
| | SURFACE FEET PER MINUTE | | | | | | | | | | | |
| Automatic Screw Machine<br>Heavy duty Single or Multiple Spindle<br>Turret Lathe<br>Based on Tungsten or Moly High Speed tooling. Rates may be increased 15-20% with High-Cobalt or Cast Alloys. | 90-100<br>80-100<br>80-100 | 120-130<br>110-150<br>100-130 | 80-100<br>60-80<br>60-80 | 90-100<br>80-100<br>80-100 | 120-130<br>110-130<br>110-130 | 80-100<br>70-90<br>70-90 | 60-80<br>50-70<br>50-70 | 80-100<br>60-80<br>60-80 | 70-90<br>60-80<br>60-80 | 100-130<br>90-120<br>90-120 | 60-80<br>60-80<br>60-80 | 70-90<br>60-80<br>60-80 |
| Automatic Screw Machine (Swiss type)<br>Based on Cast Alloy or Carbide tooling. | 110-140 | 120-150 | 90-120 | 110-140 | 120-150 | 100-140 | 60-100 | 100-140 | 80-120 | 110-150 | 80-120 | 80-120 |
| Milling<br>Reaming<br>Smooth finish at .003" / .007" Feed<br>Work sizing at .003" / .007" Feed<br>Based on Tungsten or Moly High Speed tooling. Greatly increased rates obtainable with carbide tooling.<br>Threading<br>Topping<br>Drill Press<br>Based on Tungsten or Moly High Speed tooling. | 40-60<br>15-40<br>40-120<br>10-25<br>10-25<br>40-80 | 50-80<br>15-40<br>40-120<br>10-25<br>10-25<br>60-90 | 20-50<br>15-40<br>40-120<br>10-25<br>10-25<br>30-50 | 40-60<br>15-40<br>40-120<br>10-25<br>10-25<br>40-80 | 50-80<br>15-40<br>40-120<br>10-25<br>10-25<br>60-90 | 40-60<br>15-40<br>40-120<br>10-25<br>10-25<br>40-60 | 20-50<br>15-40<br>40-120<br>10-25<br>10-25<br>30-50 | 40-60<br>15-40<br>40-120<br>10-25<br>10-25<br>40-60 | 40-60<br>15-40<br>40-80<br>10-25<br>10-25<br>30-50 | 40-60<br>15-40<br>40-120<br>10-25<br>10-25<br>30-60 | 30-50<br>15-40<br>40-80<br>10-25<br>10-25<br>30-50 | 40-60<br>15-40<br>40-80<br>10-25<br>10-25<br>30-50 |
| Single Point Turning<br>Carbide Tooling<br>Roughing<br>Finishing<br>High-Cobalt or Cast Alloy Tooling<br>Roughing<br>Finishing<br>Tungsten or Moly High-Speed Alloy Tooling<br>Roughing<br>Finishing | 150-300<br>200-400<br>100-150<br>100-150<br>80-100<br>80-130 | 150-200<br>200-400<br>100-150<br>150-200<br>80-100<br>100-150 | 100-150<br>150-250<br>80-100<br>100-150<br>60-80<br>80-120 | 150-200<br>200-400<br>100-150<br>150-200<br>80-100<br>80-130 | 150-200<br>200-400<br>100-150<br>150-200<br>80-100<br>100-150 | 140-180<br>150-200<br>90-120<br>90-140<br>60-80<br>80-100 | 100-150<br>150-200<br>60-80<br>80-100<br>40-60<br>60-80 | 140-180<br>150-200<br>100-130<br>100-150<br>60-90<br>90-120 | 120-160<br>150-200<br>100-120<br>100-150<br>60-90<br>90-120 | 150-210<br>200-400<br>100-150<br>150-200<br>70-90<br>100-140 | 150-160<br>150-200<br>100-130<br>100-150<br>60-90<br>100-120 | 150-160<br>150-200<br>100-130<br>100-150<br>60-90<br>100-120 |

(1) Spindle Speed in the Brinell Range of 240-300 may be maintained by reducing these speeds approximately 20%.
(2) When used on automatic screw machine equipment, the free machining type affords an increase of about 10% over cutting rates shown.

# Here's Top-Notch Machining Data on Stainless Steels

If you machine stainless steels here is a fact-filled booklet you should have in your shop!

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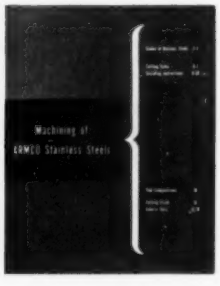
***Cutting Speeds and Feeds***—You'll find tables of speeds and tool compositions for all types of machines—from turret lathes to automatic spindle machines. This book also gives you information on milling of stainless steels, including carbide milling.

***Many Detailed Sketches***—Correct clearances and angles for various tools are described in detail, with sketches that give you actual working information on turning, milling and threading.

Helpful conversion tables, along with finishes and tolerances of stainless steel bars and wire, are included.

**Help keep steel flowing from the mills by turning in your scrap promptly.**

**THIS IS THE BOOK YOU GET!**

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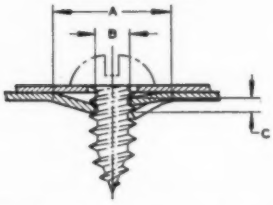
American Machinist



# Press Tools for Screw Holes in Sheet Metal . . I

These data are used in the automotive industry to provide economical fastening of mild-steel, sheet-metal parts with self-tapping screws

**PRESSED HOLE**




**SELECTION OF SCREW SIZES**

| Stock Thickness Ranges | Screw Sizes |
|---|---|
| 0.015 to 0.025 | #4-24, #6-18 |
| 0.020 to 0.025 | #4-24, #6-18, #8-15 |
| 0.025 to 0.031 | #6-18, #8-15, #10-12 |
| 0.031 to 0.037 | #8-15, #10-12 |
| 0.037 to 0.044 | #8-15, #10-12, #12-11 |
| 0.044 to 0.047 | #10-12, #12-11, #14-10 |
| 0.047 to 0.056 | #12-11, #14-10, 5/16-9 |
| 0.056 to 0.062** | #14-10, 5/16-9 |

**Heavier gages require special tools.

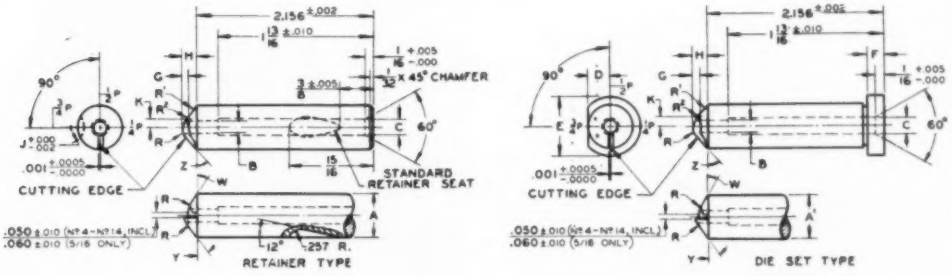
**DIMENSIONS OF PRESSED HOLES**

| Screw Size | A* | B | C |
|---|---|---|---|
| #4-24 | 0.375 | .091-.084 | 0.04167 |
| #6-18 | 0.500 | .107-.098 | 0.05556 |
| #8-15 | 0.500 | .129-.119 | 0.06666 |
| #10-12 | 0.500 | .136-.125 | 0.08333 |
| #12-11 | 0.5625 | .172-.158 | 0.09091 |
| #14-10 | 0.625 | .197-.181 | 0.10000 |
| 5/16-9 | 0.750 | .248-.230 | 0.11111 |

*Cone-base diameter *A* may be varied by use of special tools.

The hole in the lower sheet is punched with a radial slit, and the surrounding metal is formed into a spiral cone conforming to the pitch of the screw thread. Optional hole sizes are provided for a given range of stock thicknesses. For maximum rigidity, use the smaller hole sizes in combination with the heavier stock thicknesses. Development of the pierced hole to a specified formed-hole diameter is a function of bottoming pressure and stock thickness. For materials other than mild steel, data probably must be revised.

**FORMING PUNCHES**




| Stock Thickness Ranges | | .015 to .025 | .015 to .031 | .020 to .044 | .025 to .047 | .037 to .056 | .044 to .062 | .047 to .062 |
|---|---|---|---|---|---|---|---|---|
| Screw Sizes | | # 4-24 | # 6-18 | # 8-15 | #10-12 | #12-11 | #14-10 | 5/16-9 |
| A | Punch Outside Dia. (Retainer) | .3749 - .3747 | .4999 - .4997 | .4999 - .4997 | .4999 - .4997 | .6249 - .6247 | .6249 - .6247 | .7499 - .7497 |
| A' | Punch Outside Dia. (Die Set) | .3754 - .3752 | .5004 - .5002 | .5004 - .5002 | .5004 - .5002 | .6254 - .6252 | .6254 - .6252 | .7504 - .7502 |
| B | Small Hole Diameter | .064 - .063 | .086 - .084 | .098 - .096 | .099 - .096 | .129 - .126 | .166 - .163 | .185 - .182 |
| C | Large Hole Diameter | .073 - .070 | .093 - .087 | .108 - .104 | .108 - .104 | .140 - .136 | .173 - .169 | .191 - .187 |
| D | Center to Flat on Head | .1875 - .1870 | .2500 - .2495 | .2500 - .2495 | .2500 - .2495 | .2812 - .2807 | .3125 - .3120 | .3750 - .3745 |
| E | Head Diameter | .565 - .555 | .685 - .675 | .685 - .675 | .685 - .675 | .748 - .738 | .875 - .865 | 1.005 - .99 |
| F | Head Thickness | .1255 - .1245 | .1875 - .1865 | .1875 - .1865 | .1875 - .1865 | .1875 - .1865 | .2505 - .2495 | .2505 - .24 |
| G | Height | .047 - .042 | .060 - .056 | .074 - .067 | .094 - .084 | .102 - .092 | .111 - .101 | .122 - .112 |
| H | Height of Form | .113 - .110 | .125 - .120 | .135 - .130 | .147 - .140 | .160 - .150 | .170 - .160 | .180 - .170 |
| J | Seat Radius | 1/8 | 5/32 | 5/32 | 5/32 | 5/32 | 5/32 | 3/16 |
| K | From Center to Axis of R² | .062 | .069 | .088 | .092 | .110 | .125 | .150 |
| R | Radius (end of cut - 1/4p & 3/4p) | .032 | .035 | .040 | .047 | .056 | .062 | .080 |
| R' | Radius (at 1/2 pitch) | .100 | .170 | .187 | .187 | .156 | .156 | .250 |
| R² | Radius (at end - 1/2 pitch) | .060 | .070 | .078 | .093 | .100 | .117 | .125 |
| W | Angle (at 1/4 pitch) | 32° 50' | 23° 25' | 26° 13' | 26° | 25° 24' | 24° 15' | 21° 44' |
| Y | Angle (at 3/4 pitch) | 40° 9' | 31° 11' | 36° 8' | 38° 53' | 38° 16' | 37° 38' | 35° 26' |
| Z | Angle - (at cutting edge) | 41° 38' | 33° 35' | 38° 2' | 41° 34' | 41° 43' | 40° 35' | 37° 53' |

Forming punches are made of tool steel, hardened and tempered to Rockwell C59 to C61; piercing punches, C63 to C64.

# CIRCUIT BREAKERS SAVE PRODUCTION TIME

***Circuit breakers*** hold harmless momentary overloads... but trip quickly on shorts. Eliminate needless "down" time.

***Circuit breakers*** can be easily re-set by anyone. No live parts exposed. Nothing burns out... nothing to replace. There's no delay.

***Circuit breakers*** open all lines simultaneously... prevent motor damage due to single phasing.

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**Thermal** element responds to heating effects of both load current and surrounding atmosphere. Total temperature is limited to a safe value.

**Magnetic** element responds instantly to heavy overloads or shorts. Damage is minimized.

***Both Elements are needed for Complete protection!***

***A Complete Line of Thermal-Magnetic Circuit Breakers!***

Five frame sizes and four enclosure types—dust-resisting, rain-tight, weatherproof and dust-tight, explosion-resisting.

| | AMPERE RANGE | | | | |
|---|---|---|---|---|---|
| VOLTS | ML | ML 1 | ML 2 | ML 3 | WL |
| 250 | 15-50 | 70-100 | — | 125-225 | 225-600 |
| 600 | — | 15-50 | 70-100 | 125-225 | 225-600 |

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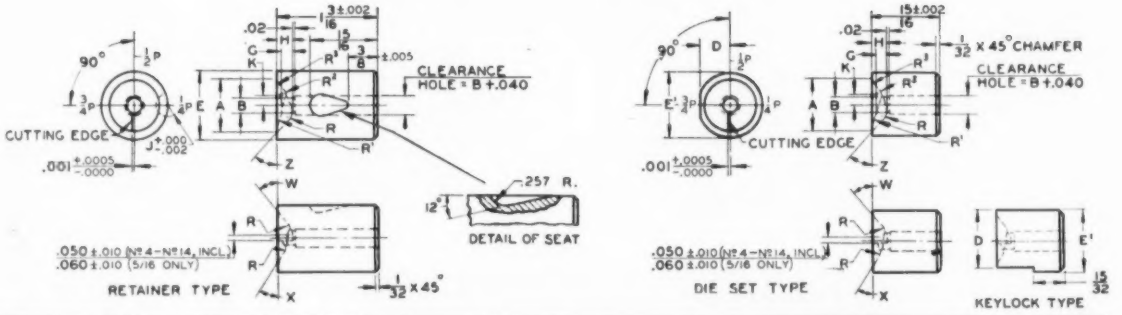
REFERENCE BOOK SHEET

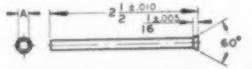
## DIES FOR PRESSED HOLES




| Stock Thickness Ranges | | .015 to .025 | .015 to .031 | .020 to .044 | .025 to .047 | .037 to .056 | .044 to .062 | .047 to .062 |
|---|---|---|---|---|---|---|---|---|
| Screw Sizes | | # 4-24 | # 6-18 | # 8-15 | #10-12 | #12-11 | #14-10 | 5/16-9 |
| A | Cone Diameter * | .399 - .394 | .523 - .518 | .535 - .530 | .541 - .536 | .609 - .604 | .676 - .671 | .797 - .792 |
| B | Hole Diameter | .071 - .068 | .091 - .089 | .106 - .104 | .106 - .104 | .139 - .136 | .179 - .177 | .199 - .196 |
| D | Center to Flat on Head | .2505 - .2500 | .3130 - .3125 | .3130 - .3125 | .3130 - .3125 | .3755 - .3750 | .3755 - .3750 | .4380 - .4375 |
| E | Body Diameter (Retainer Type) | .6249 - .6247 | .7499 - .7497 | .7499 - .7497 | .7499 - .7497 | .8749 - .8747 | .8749 - .8747 | .9999 - .9997 |
| E' | Body Diameter (Die Set Type) | .6260 - .6255 | .7510 - .7505 | .7510 - .7505 | .7510 - .7505 | .8760 - .8755 | .8760 - .8755 | 1.0010 - 1.0005 |
| G | Depth | .047 - .042 | .061 - .056 | .074 - .067 | .094 - .084 | .102 - .092 | .111 - .101 | .122 - .112 |
| H | Depth of Die | .110 - .108 | .120 - .118 | .130 - .128 | .140 - .138 | .150 - .148 | .160 - .158 | .170 - .168 |
| J | Seat Radius | 1/8 | 5/32 | 5/32 | 5/32 | 5/32 | 5/32 | 3/16 |
| K | From Center to Axis of R² | .072 - .062 | .079 - .074 | .098 - .093 | .102 - .097 | .120 - .115 | .135 - .125 | .160 - .150 |
| R | Radius (End of Cut - 1/4p & 3/4p) | .070 - .060 | .077 - .067 | .096 - .086 | .106 - .096 | .119 - .109 | .136 - .126 | .155 - .145 |
| R' | Radius (Cutting Edge) | .160 | .156 | .204 | .312 | .256 | .375 | .375 |
| R² | Radius - Bottom (at 1/2 pitch) | .092 - .087 | .108 - .103 | .130 - .125 | .147 - .142 | .161 - .156 | .182 - .177 | .192 - .187 |
| R³ | Radius - Top (at 1/2 pitch) | .075 - .070 | .138 - .133 | .141 - .136 | .138 - .133 | .100 - .095 | .094 - .089 | .187 - .182 |
| W | Angle (at 1/4 pitch) | 38° 46' | 30° 33' | 34° 12' | 34° 48' | 33° 24' | 31° 34' | 36° 7' |
| X | Angle (at 3/4 pitch) | 30° 16' | 22° 5' | 26° 35' | 25° 12' | 24° 4' | 22° 41' | 21° 3' |
| Z | Angle (Below cutting edge) | 39° 35' | 32° 12' | 35° 12' | 37° 44' | 37° 17' | 35° 36' | 33° 21' |

**General Specifications:** Forming dies shall be made of tool steel hardened and tempered to Rockwell C59 to C61.

## PIERCING PUNCHES




| Screw Sizes | # 4-24 | # 6-18 | # 8-15 | #10-12 | #12-11 | #14-10 | 5/16-9 |
|---|---|---|---|---|---|---|---|
| A Punch Diameter | .0625 - .0615 | .0825 - .0815 | .0955 - .0945 | .0955 - .0945 | .1255 - .1245 | .1625 - .1615 | .1805 - .1795 |

# 5 METALS IN PRECISION-MADE REEL MACHINED WITH ONE SUNICUT OIL

The Ocean City Manufacturing Company operates Brown & Sharpe automatics on free-turning brass, aluminum, cold-rolled steel, phosphor and hardware bronze. Having used Sunicut Cutting Oils since 1941 with complete satisfaction, the plant decided a year ago to find out what other products could do. Numerous competitive oils were tested, and the best was selected for a long trial run.

But this oil did not prove satisfactory in actual use. It caused the gibs to corrode and the slides to stick. Operators found miking difficult. Downtime and rejects grew to disturbing proportions. Finally, to protect its automatics and restore its production efficiency, the plant decided to go back to Sunicut Cutting Oils and standardized on Sunicut 11.

Sunicut 11 is a "Job Proved," dual-purpose cutting oil for automatic screw machines. Its transparency permits quick and accurate miking. Among its virtues is the fact it will not stain brass. It drains rapidly, minimizing carry-off. And its high lubricating and cooling properties aid in prolonging tool life and improving finishes. Moreover, it protects finished parts from rust and corrosion. For other outstanding cutting oil case histories write for booklet AM-5.

**MACHINE:** Brown & Sharpe No. 2G • **METAL:** 11 ST aluminum **OPERATIONS:** Feed stock, center drill, counterbore, recess and countersink, tap, form and cut off • **SFPM:** 800 • **SPEED:** 3,150 rpm **PRODUCTION:** 250 collar housings per hr. • **CUTTING OIL:** Sunicut 11

**MACHINING PARTS** for Ocean City's "90" Automatic Reel. Sunicut 11 does not corrode the bronze gibs of the automatics, minimizes carry-off, makes miking easy. A coolant tried as an "economical" replacement failed on all three counts.

**THIS AUTOMATIC REEL** contains six types of metals . . . free-turning brass, aluminum, cold-rolled and stainless steel, phosphor and hardware bronze. Another Sunicut grade is used on the stainless steel.

**THE PRECISION PARTS** that Sunicut 11 helps to make possible are put to the test as this top-quality reel goes into action. Little does the fisherman know how much of his pleasure he owes to a cutting oil.

**SUN INDUSTRIAL PRODUCTS**

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO®

# Heat Treatment of Boiler Steels

Prepared by the Materials Div., Pressure Vessel Committee of the Welding Research Council from an original tabulation by W. P. Gerhart, Bethlehem Steel Co.

| ASTM SPEC | | CHEMICAL REQUIREMENTS, PER CENT (1) | | | | | | | | TENSILE (2) STRENGTH REQUIREMENT P.S.I. | THICKNESS RANGE (3) INCHES | ANNEALING TREATMENT (4) | | (4) NORMALIZING TEMP °F | (5) HOT FORMING TEMP RANGE °F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NO. | GRADE | CARBON | MANGANESE | SILICON | NICKEL | CHROMIUM | MOLYB-DENUM | COPPER | VANADIUM | | | TEMP °F | COOLING RATE | | |
| A 30 | A | 0.25 MAX | 0.30-0.80 | | | | | 0.25 MAX | | 55/85,000 | 1/8 - 5/8 | 1800 | FURNACE COOL | 1700 | 1750 - 1550 |
| | | 0.30 MAX | " " | | | | | " | | | 5/8 - 2 | " | TO 1300°F | " | " " |
| | B | 0.25 MAX | " " | | | | | " | | 48/58,000 | 1/8 - 5/8 | " | @ 30°/HR; | " | " " |
| | | 0.30 MAX | " " | | | | | " | | " " | 5/8 - 2 | " | AIR COOL | " | " " |
| A 201 | A | 0.20 MAX | 0.80 MAX | 0.15-0.30 | | | | | | 55/85,000 | 1/8 - 1 | 1800 | FURNACE COOL | 1700 | 1750 - 1550 |
| | | 0.24 MAX | " | " " | | | | | | " " | 1 - 2 | " | TO 1300°F | " | " " |
| | | 0.27 MAX | " | " " | | | | | | " " | 2 - 4 | " | @ 30°/HR; | " | " " |
| | B | 0.24 MAX | " | " " | | | | | | 60/70,000 | 1/8 - 1 | " | AIR COOL | " | " " |
| | | 0.27 MAX | " | " " | | | | | | " " | 1 - 2 | " | | " | " " |
| | | 0.30 MAX | " | " " | | | | | | " " | 2 - 4 | " | | " | " " |
| A 202 | A | 0.17 MAX | 1.05 - 1.40 | 0.60-0.90 | | 0.30-0.80 | | | | 75/90,000 | 1/8 - 1 | 1550 | FURNACE COOL | 1800 | 1700 - 1500 |
| | | " | " " | " " | | " " | | | | " " | 1 - 2 | " | TO 1100°F | " | " " |
| | B | 0.25 MAX | " " | " " | | " " | | | | 85/100,000 | 1/8 - 1 | " | @ 20°/HR; | " | " " |
| | | " | " " | " " | | " " | | | | " " | 1 - 2 | " | AIR COOL | " | " " |
| A 203 | A | 0.17 MAX | 0.80 MAX | 0.15-0.30 | 2.00-2.75 | | | | | 65/77,000 | 1/8 - 1 | 1475 | | 1800 | 1850 - 1450 |
| | | " | " | " " | " " | | | | | " " | 1 - 2 | " | | " | " " |
| | | 0.20 MAX | 0.90 MAX | " " | " " | | | | | " " | 2 - 4 | " | | " | " " |
| | B | " | 0.80 MAX | " " | " " | | | | | 70/82,000 | 1/8 - 1 | " | | " | " " |
| | | " | " | " " | " " | | | | | " " | 1 - 2 | " | | " | " " |
| | | 0.23 MAX | 0.90 MAX | " " | " " | | | | | " " | 2 - 4 | " | FURNACE COOL | " | " " |
| | C | 0.25 MAX | 0.80 MAX | " " | " " | | | | | 75/87,000 | 1/8 - 1 | " | TO 800°F | " | " " |
| | | " | " | " " | " " | | | | | " " | 1 - 2 | " | @ 20°/HR; | " | " " |
| | | 0.27 MAX | 0.90 MAX | " " | " " | | | | | " " | 2 - 4 | " | AIR COOL | " | " " |
| | D | 0.17 MAX | 0.80 MAX | " " | 3.25-3.75 | | | | | 65/77,000 | 1/8 - 1 | 1425 | | " | " " |
| | | " | " | " " | " " | | | | | " " | 1 - 2 | " | | " | " " |
| | | 0.20 MAX | 0.90 MAX | " " | " " | | | | | " " | 2 - 4 | " | | " | " " |
| | E | " | 0.80 MAX | " " | " " | | | | | 70/82,000 | 1/8 - 1 | " | | " | " " |
| | | " | " | " " | " " | | | | | " " | 1 - 2 | " | | " | " " |
| | | 0.23 MAX | 0.90 MAX | " " | " " | | | | | " " | 2 - 4 | " | | " | " " |
| A 204 | A | 0.18 MAX | 0.90 MAX | 0.15-0.30 | | | 0.40-0.60 | | | 65/77,000 | 1/8 - 1 | 1800 | | 1850 | 1700 - 1550 |
| | | 0.21 MAX | " | " " | | | " " | | | " " | 1 - 2 | " | | " | " " |
| | | 0.23 MAX | " | " " | | | " " | | | " " | 2 - 4 | " | FURNACE COOL | " | " " |
| | B | 0.20 MAX | " | " " | | | " " | | | 70/82,000 | 1/8 - 1 | " | TO 1200°F | " | " " |
| | | 0.23 MAX | " | " " | | | " " | | | " " | 1 - 2 | " | @ 20°/HR; | " | " " |
| | | 0.25 MAX | " | " " | | | " " | | | " " | 2 - 4 | " | AIR COOL | " | " " |
| | C | 0.23 MAX | " | " " | | | " " | | | 75/87,000 | 1/8 - 1 | " | | " | " " |
| | | 0.28 MAX | " | " " | | | " " | | | " " | 1 - 2 | " | | " | " " |
| | | 0.28 MAX | " | " " | | | " " | | | " " | 2 - 4 | " | | " | " " |
| A 212 | A | 0.28 MAX | 0.90 MAX | 0.15-0.30 | | | | | | 65/77,000 | 1/8 - 1 | 1550 | | 1700 | 1700 - 1500 |
| | | 0.31 MAX | " | " " | | | | | | " " | 1 - 2 | " | FURNACE COOL | " | " " |
| | | 0.33 MAX | " | " " | | | | | | " " | 2 - 4 | " | TO 1200°F | " | " " |
| | B | 0.31 MAX | " | " " | | | | | | 70/82,000 | 1/8 - 1 | " | @ 20°/HR; | " | " " |
| | | 0.33 MAX | " | " " | | | | | | " " | 1 - 2 | " | AIR COOL | " | " " |
| | | 0.35 MAX | " | " " | | | | | | " " | 2 - 4 | " | | " | " " |
| A 225 | A | 0.18 MAX | 1.45 MAX | 0.15-0.30 | | | | | 0.08-0.14 | 70/82,000 | 1/8 - 1 | 1800 | | 1700 | 1750 - 1550 |
| | | " | " | " " | | | | | " " | " " | 1 - 2 | " | FURNACE COOL | " | " " |
| | | " | " | " " | | | | | " " | " " | 2 - 4 | " | TO 1200°F | " | " " |
| | B | 0.20 MAX | " | " " | | | | | " " | 75/87,000 | 1/8 - 1 | " | @ 20°/HR; | " | " " |
| | | " | " | " " | | | | | " " | " " | 1 - 2 | " | AIR COOL | " | " " |
| | | " | " | " " | | | | | " " | " " | 2 - 4 | " | | " | " " |
| A 285 | A | 0.15 MAX | 0.80 MAX | | | | | 0.35 MAX | | 45/55,000 | TO 5/8 | 1800 | | 1700 | 1750 - 1550 |
| | | 0.17 MAX | " | | | | | " | | " " | 5/8 - 2 | " | FURNACE COOL | " | " " |
| | B | 0.20 MAX | " | | | | | " | | 50/60,000 | TO 3/4 | " | TO 1300°F | " | " " |
| | | 0.22 MAX | " | | | | | " | | " " | 3/4 - 2 | " | @ 30°/HR; | " | " " |
| | C | 0.25 MAX | " | | | | | " | | 55/65,000 | TO 7/8 | " | AIR COOL | " | " " |
| | | 0.30 MAX | " | | | | | " | | " " | 7/8 - 2 | " | | " | " " |
| A 299 | | 0.28 MAX | 0.90-1.40 | 0.15-0.30 | | | | | | 75/90,000 | TO 1 | 1550 | FURNACE COOL | 1800 | 1700 - 1500 |
| | | 0.31 MAX | " " | " " | | | | | | " " | 1 - 2 | " | TO 1200°F @ 20°/HR; AIR COOL | " | " " |
| A 301 | | 0.21 MAX | 0.80 MAX | 0.15-0.30 | | 0.50-0.70 | 0.40-0.60 | | | 85/82,000 | TO 1 | 1600 | FURNACE COOL TO 1200°F @ 20°/HR; AIR COOL | 1700 | 1700 - 1550 |
| | | " | " | " " | | " " | " " | | | " " | 1 - 2 | " | | " | " " |
| | | " | " | " " | | " " | " " | | | " " | 2 - 4 | " | | " | " " |
| A 302 | A | 0.20 MAX | 0.90-1.30 | 0.15-0.30 | | | 0.40-0.60 | | | 75/95,000 | TO 1 | 1550 | | 1800 | 1700 - 1550 |
| | | 0.23 MAX | " " | " " | | | " " | | | " " | 1 - 2 | " | FURNACE COOL | " | " " |
| | | 0.25 MAX | " " | " " | | | " " | | | " " | 2 - 4 | " | TO 1200°F | " | " " |
| | B | 0.20 MAX | 1.10-1.50 | " " | | | " " | | | 80/100,000 | TO 1 | " | @ 20°/HR; | " | " " |
| | | 0.23 MAX | " " | " " | | | " " | | | " " | 1 - 2 | " | AIR COOL | " | " " |
| | | 0.25 MAX | " " | " " | | | " " | | | " " | 2 - 4 | " | | " | " " |

Notes:

1. Not included: (a) requirements for phosphorous and sulfur, which differ between flange and firebox grades, (b) yield point and elongation, (c) thicknesses in excess of 4 in. See individual ASTM specifications.

2. Holding times at temperatures for annealing and normalizing should not be less than one hour per inch thickness.

3. Maximum temperature for hot forming should give minimum grain growth, while minimum of range should provide minimum distortion. Final sizing may be done below minimum of temperature range, if metals is still at red heat and distortion is not excessive.

4. If required heat treatment is to be obtained in conjunction with hot forming, the temperature for hot forming shall be equivalent to, but not significantly exceed, the normalizing temperature. Stress-relieving should comply with ASME Boiler Code.

# WHAT PRICE *Precision*

Typical "ground all over" series 1600 "precision" bearing.

Typical "unground" series 3000 "precision type" bearing.

**NICE**
**BALL BEARINGS**

Yes, the bearings illustrated *are* identical, *except* for degree of precision. Because of the precision differences, there is a substantial difference in cost . . . NICE can provide bearings incorporating any degree or combination of precision features between the higher priced "ground all over" series 1600 and the low cost "unground" series 3000.

The specific requirements of your particular application should determine the precision features of the bearing you use. WHAT PRICE ARE YOU PAYING FOR PRECISION? ARE YOU BUYING MORE PRECISION THAN YOUR BEARING APPLICATION REQUIRES?

NICE

**NICE BALL BEARING CO.**
NICETOWN PHILADELPHIA PENNSYLVANIA

# TALKING SHOP

### Flying Wing

FEW LAYMEN consider that an aircraft propeller is a wing in miniature, but few engineers not connected with aircraft companies realize that the six 3-bladed propellers on a B-36 have about 30 sq ft *more* surface area than the wings on an X-1 fighter.

### Not Too Fussy

IN THE Boremetic room at the Allerton Street (Lynn, Mass.) plant of GE, this motto is posted conspicuously: "Don't be too fussy. Just get it right the first time—and let it go at that."

### Unhidable

PLANTS making military items seem to worry extensively about thefts of drawings—principally because the drawings can be folded and smuggled out. One solution that suggests itself is to encase the critical drawings in plastic as identification cards are now! This would not only lengthen life, but would make the drawing so big—and so unfoldable—that it represents a major task to get it past plant gates. An alternate idea is to check drawings in and out just like small tools.

### Wear Detective

A NEW CENTER-DRILLING machine is designed to balance forgings, then to drill on the dynamic center line rather than the apparent one. It apparently doubles or triples tool life, because the tools, once started, cut *under* the scale constantly. Running tools in and out of scale is what causes tool wear. The drilling machine is so sensitive, incidentally, that it well detect wear in forging dies before forging-machine operators catch it. When wear begins, dies can be corrected quickly and cheaply. This saves material in forgings and lengthens die life three or four times.

### Ten Cents a Drop

SPECIAL OIL used for lubricating a fine watch doesn't seem expensive until you realize that a standard 55-gal. drum of it would cost a third of a million dollars. Because of the special properties required, Hamilton Watch Co. makes its own in a miniature refinery where a batch is about one-half pint—enough for approximately a half-million watches. The cost is $6000 a gallon, and it is doled out in drops with a hypodermic syringe into tiny glass dishes. Even so, considerably more oil is wasted than is actually used in the watches.

### Contraption

A METAL GADGET has been applied to poles of the electric transmission lines of the Andes Copper Mining Company of Chile. It is a strap-iron upright to which another upright carrying an inviting perch is connected by short upper and lower levers. The upper lever is extended past the joint to terminate in a counterweight and three convincing spikes faced back toward the perch. When a buzzard or other large bird settles on the perch, the bird's weight lowers the perch, swinging the spikes up to whang him sharply fore or aft. The bird leaves promptly. This prevents short-circuits on the line—and saves the bird's life.

### High-rake Coolant

IN MILLING with high-rake angles (see *AM*, April 3, 1950, p122), Jones & Lamson has found that a flood of coolant is advisable to prevent any appreciable temperature rise in the cutter. The cutter will, to some extent, carry the coolant in. High rakes do not work well on cast iron, because the scale is abrasive—or on hot-rolled material if the scale is still on. The only other exception is possibly stainless steel, although high-sulfur-base oil may solve this. Water-soluble coolants work on most steels, but a 50-50 mixture of heavy sulfur-base oil and a cut-back oil works best on HSS and tool steels.

### Daffynitions

DENTIST: man who pulls against you. . . . GOLF BALL: sphere which, when you can afford to lose it, you can't hit it that far. . . . CALORIES: eatomic energy. . . . SKID ROW: march of dimes. . . . MIDGET FUNERAL: check for a small bier. . . . MINT: only manufacturing plant that makes money without advertising. . . . SPINSTER: woman who is free, wide, and twenty-once. . . . MEN: the simple things in life women go for. . . . WOMEN: attractive at 20, attentive at 30, adhesive at 40. . . . BACHELOR: foot loose and fiancee free.

### To the Engineer

PITNEY-BOWES, INC., dedicates its Annual Report to the engineer. Here's an extract: "At this hour, we are profoundly aware of the production engineer and his partner, the development engineer — and their teammates in drafting room and toolroom, in model shop and machine shop—who labor in proud anonymity to bring the dreams of free, enterprising men from the potential of the drawing board to the reality of the production line. Today, an America that seeks peace, yet must arm for war, again calls upon this unique man of industry to tool up the nation for another great battle of production. In peace or in war, we trust this man with brains, the know-how, and the calm self-effacement. And we salute him, wherever he is . . . In the vast aircraft plant, the precision business machines factory, or the back-alley machine shop. Let us use with skill and faith the tools of freedom he is designing . . . "

### Sticky Job

SMALL PARTS, particularly of steel, are corroded easily. One instrument maker keeps them under oil in a jar about the size of the cold-cream "economy" size. Spindled or shanked parts can readily be held by doll-size racks, designed to fit into the oil container, if parts together will be damaged or tangled.

# News of Metalworking——

## McGraw-Hill WORLD NEWS

**INDIA MAKES PLANES** — Airplanes now are being manufactured from scratch in India for the first time at the Hindustan Aircraft Factory in Bangalore. Type now under construction is the HT-2 dual control trainer. Initial order placed by the government is for 150.

**CAR EXPORTS PUSHED** — The West German automobile industry made a strong bid to increase exports at the first post-war German International Motor Show which opened April 10 at Frankfurt. Many firms, including Opel, Borgward, and Hanomag, have followed the prevailing American fashion of design. Star of the show was the new 1115bhp Mercedes "300," at a price of some 18,000 Deutsche Marks. The makers claim a maximum speed of 155 kph.

**BOVERI IN CANADA**—The Swiss Company, AC Brown Boveri of Baden, intend to erect a plant in Canada for manufacture of compressed air switches and possibly small transformers. The firm has purchased an area of about 276,000 sq meters at St. John, south of Montreal, and plans initially to erect two factory buildings there.

**GEAR SHOP OPENED** — The Broken Hill Proprietary Co. Ltd. has obtained the services of J. Guangorena, gear cutting expert from Westinghouse Corp.'s Sunnyvale, Calif., plant, to supervise installation of hobbing machines and other machine tools at BHP's Whyalla, South Australia shipyards. The new 83x400-ft gear shop has an air-conditioned hobbing room.

**NEW LIGHT CAR**—The Australian-built Hartnett 6-hp light car will come off assembly lines at the rate of 200 a month by August, according to the chairman and managing director of Hartnett Motor Co., L. J. Hartnett. The rate will be increased to 500 a month by the end of the year, he predicted. He is going to London to speed up supply of equipment needed for quicker production. The car is priced at £549 (Australian).

# Machinery Prices Rolled Back;

WASHINGTON—Following up last week's manufacturer's price order, the Office of Price Stabilization has now issued a supplementary regulation for machinery.

Covered are firms producing prime movers, industrial power apparatus, material and work fabricating equipment, machine tools, farm and electrical machinery, forgings, transportation equipment, and construction and mining machinery.

Exempt are used machinery and rental equipment. The order does not set ceiling prices on items for resale.

• **The new rule**— Ceiling Price Regulation No. 30—duplicates the manufacturers' order in many respects. But there are important differences; and most of these will make life easier for machinery makers.

Even so the industry won't be crazy about the order. Prices will be rolled back on practically all machinery products. The regulation, however, is much more liberal than the producers have expected.

CPR-30 resembles the manufacturers' regulation closely in the method it prescribes for the pricing of standard items. It permits machine makers to add increases in factory payroll and material costs to pre-Korean prices in effect during optional base periods—either April 1 through June 24, 1950, or any one of the three previous calendar quarters.

## MATERIALS: How Much You're Permitted to Use

**ALUMINUM:** For May and June you are limited (in manufacture of some 200 consumer items) to 50% of aluminum used in average month of the base period (first six months of 1950). Use of aluminum for MRO supplies is limited to same amount used in base period. Working inventory permitted: 60-day supply. (M-7, as amended Apr. 20, 1951.)

**CADMIUM:** Use restricted to certain essential items, such as anchorage of punch press dies, bearings for rolling mills, threaded parts for use in aircraft, various alloys, and parts subjected to heavy corrosion. Inventory limitation: 30-day supply.

**COLUMBIUM AND TANTALUM:** Anyone using or holding more than 10 lb of contained columbium or tantalum in any month must file a report of inventory and consumption. Inventory limitation: 45-day supply. (M-49, as amended Apr. 26). NPA order M-3, as amended Mar. 15, limits use of columbium and tantalum bearing steels to DO rated orders.

**COPPER:** Production of brass mill and copper wire mill products limited to 80% of average quarterly output during base period. One month's output is limited to 40% of the permitted quarterly production. Quarterly output of foundry products limited to 100% of production in base period. Use of copper forms and products limited to 75% of average quarterly use in base period. Inventory limitations: 45-day supply for producers, 60-day supply for users, or for MRO supplies. (M-12, as amended Apr. 1.)

**IRON AND STEEL:** Use in consumer durable goods is limited to 80% of average quarterly use during base period. In any one month, not more than 40% of permitted quarterly amount may be used. No limitation on use of steel for replacement parts. Not more than 40% of amount assembled in base period can be assembled in second quarter of 1951 (Applies to assemblers only, not manufacturers). Firms that used not more than 100 tons of iron or steel per quarter in the base period can use an equal amount in second quarter, 1951. (M-47, as amended Apr. 4.)

**MOLYBDENUM:** Deliveries are permitted without NPA authority to anyone whose total receipts during current months are not more than 200 lb, except for molybdenum metal powder, wire, rod or sheet, which are subject to full allocation. Inventory limitations: 60 days' requirements for powder, wire, rod or sheet; 45 days' requirements on all other forms of molybdenum. (M-33, as amended Mar. 27.) NPA order M-52, (Mar. 31) limits to 2.5% the molybdenum content of stainless steel.

**LEAD:** Consumers of lead are limited to 100% of their rate of use of the metal during base period. Inventory permitted: 30 days' supply. (M-38, amended Apr. 3.)

**NICKEL:** Use of nickel-bearing stainless steel, high nickel alloy, and nickel plating may not be used in a long list of items, under NPA order M-14. Consumption of primary nickel for non-rated orders is limited to 65% of average quarterly use during base period. Inventory limitation: 30 days' supply. (M-14, as amended Mar. 31.)

**TIN:** May not be used for ornamental decorative purposes. Tin plate and terneplate manufacturers may use in second quarter 1951 not more than 95% of that used in their monthly base period. All other users of pig tin are permitted in second quarter 90% of their monthly base period usage. Inventory limitations: pig tin, 120 days' supply for tin plate manufacture, 60 days for any other purpose; 60 days for copper-base alloys, solder, babbitt, and other alloys containing 1.5% or more tin, and all other materials containing tin. Only the RFC may import tin. (M-8, as amended Apr. 2.)

# Used Equipment Exempted

• **Materials costs** include cutting wheels, dies, jigs and fixtures used specifically for the production of the priced items. Labor costs include product engineering expansions and ordinary maintenance of plant and equipment. Excluded are general administrative expenses, advertising costs and general research.

Instead of the delivered price, machinery firms must use published list prices.

But the production of machinery is unique in manufacturing in that its output includes a high percentage of specially-built, custom-designed items. So, in a great many cases, no base period list prices exist. CPR-30, however, has a special premium for figuring the base price of such goods.

Section 9 of the order permits the builder of a unique machine to figure his base period cost from:

• The hourly rates paid to workers on similar equipment during the time period multiplied by the number of hours required.

• Overtime and shift premiums that had to be paid to produce the item, calculated at base period rates.

• The cost during the base period of the materials used.

• Base period subcontracting costs for parts, assemblies or units produced outside the plant.

Once the base period price has been constructed, makers of both list price and custom-built machinery simply add cost increases up to March 1, 1951. To get legal ceiling prices here, overtime and subcontracting cost increases can not be included.

Effective date of the order is May 28, 1951 the same day as the manufacturers' order.

OPS officials realize that lack of permission to figure overtime and subcontracting costs since Korea will squeeze the industry's profit margins. They hope to provide some measure of relief in future amendments.

• **Also due out in months to come** are specially tailored orders that will cover fabricated steel shapes, plates and bars, and machine tools. Work on the special machine tool regulation will get under way soon.

# Stopgap Manufacturers' Price Order Issued

WASHINGTON — Most manufacturers will be released from last January's price freeze on May 28 when the General Manufacturers' Regulation goes into effect. The manufacturer's pricing order is intended as a stopgap until price controls for individual industries come along (such as the machinery pricing order, reported on these pages).

Under the general order, manufacturers may increase prices that are not high enough to cover post-Korea increases in payroll and material costs. But prices beyond such increases must be rolled back.

• **Covered by the regulation** are some 75,000 manufacturing concerns and most of the major lines of manufactured goods. Not covered are industries already under their own ceilings or soon to be covered by special orders. Also exempted are items not covered by the earlier general price freeze, along with fabricated structural steel, primary metals and alloys, and metallic ores.

All manufacturers with gross sales of less thain $250,000 have the choice of remaining under the general freeze, or repricing under the new regulation.

The regulation allows only for past cost increases, does not carry any implication that future cost increases will be handled on a similar automatic basis.

The regulation allows manufacturers to add increases in factory payroll and material costs to pre-Korean prices in effect during optional base periods—either April 1 through June 24, 1950, or any one of the three previous calendar quarters. This option allows for seasonal variations.

• **Materials cost adjustment** may be calculated by four alternate methods —designated aggregate, unit cost, best selling item, and bill of materials.

Simplest for most manufacturers is the aggregate method, based on a unit of the business or, if the business is not divided, on the entire business. The entire business cannot be used if there is more than one plant.

For the entire business the manufacturer:

• Takes net sales for the last fiscal year ended not later than Dec. 31, 1950.

• Multiplies the physical amount of each material used in production during the year by the dollar-and-cents change in cost per unit between the end of his base period and Dec. 31, 1950 (or up to March 15, 1951, in the case of raw materials, imports, basic ores and metals, and other materials not covered by the regulation).

• Adds the resulting figures, and subtracts decreases from increases to get the total material increases.

• Divides the result by sales to get the "materials cost adjustment factor."

• Multiplies the base period price of the commodity by the "materials cost adjustment factor."

**Labor cost adjustments** may be calculated as follows:

| | |
|---|---|
| Net sales for last fiscal year in 1950 | $1,000,000 |
| Factory payroll in same period | 300,000 |
| Labor cost ratio | 30% |
| Last payroll in base period selected | 6,000 |
| Same payroll at Mar. 15, 1951, rates | 6,500 |
| Increased "fringe benefits" | 100 |
| Recomputed payroll | 6,600 |
| Wage increase factor ($600 divided by $6,000) | 10% |
| Labor cost adjustment factor (10% of 30%) | 3% |

The 3% is added to a product's base period price. This computation may apply to the entire business or to a unit with regularly maintained separate records.

Hardship appeals are permitted if a manufacturer shows a net loss on total operations for at least one month under the new ceiling prices. Such cases will be acted on by OPS within 30 days.

# Here's What You Do to Get Vital Materials

WASHINGTON—Here's a summary of the rules under which you will get controlled materials when CMP goes into effect July 1. It includes the highlights of what has been decided up to press time.

**Q. What's the big difference between CMP and the DO system used now by metalworking industries?**

**A.** A timetable. CMP requires that you order controlled materials on a time schedule, and that you deliver finished products on a time schedule.

**Q. What's the big difference between the 1951 CMP model and the one we had in War II?**

**A.** The 1951 model allocates only part of the supply of basic metals.

**Q. What are the controlled materials?**

**A.** CMP materials are steel, copper and aluminum, in the forms and shapes listed in Schedule I of CMP Regulation I. (Copies of this and other CMP material will be available from the National Production Authority, Department of Commerce, Washington, D. C., and from field offices of the Department of Commerce.)

**Q. How will I get controlled materials?**

**A.** Find out whether you make anything listed as a "Class B" product in the official "CMP 4B Product Class Reference Manual." If you make a product on this list, you can apply for an authorized production schedule and an allotment of material.

**Q. In general, what products are on the B list?**

**A.** Industrial machinery and equipment, component and certain civilian-type products.

**Q. If I make a B product, do I have to file?**

**A.** If you want an allotment of materials, yes. If you don't file, NPA may "request" you to.

**Q. What happens if I don't make anything on the B list?**

**A.** If you fabricate or assemble any of the controlled materials, and your product is not on the B list, then you make a class A product.

**Q. If I make an A product, where do I file for an allotment?**

**A.** You don't file—unless invited to. You can be invited to file either by a government claimant agency or by a customer who wants you to make a product for him. You file with whoever asks you to—the claimant agency or your customer. Your claimant agency or customer will get your allocations for you for your "A" products.

**Q. If I'm not invited to file, and don't receive an allotment for "A" products, do I get any steel, copper or aluminum?**

**A.** Not by allotment. You are outside the CMP system and must scramble for whatever controlled materials you can find in the so-called "free pool." The free pool is the amount left over when the allotments are handed out.

**Q. How much will that be?**

**A.** Nobody knows yet. Planners talk about 70% as much steel as early 1950—something in that neighborhood. Exactly how much is the final, tough decision which will have to be made about CMP.

**Q. Who makes it?**

**A.** Officially, the Requirements Committee of the Defense Production Administration. Actually, it will go up to Chief Mobilizer Wilson and probably to President Truman.

**Q. What forms do I use in applying?**

**A.** 4A for A products. 4B for B products.

**Q. When are applications for a production schedule due in Washington?**

**A.** NPA would like them by May 15, but in no case later than May 31.

**Q. Who approves my production schedules for A products?**

**A.** In the case of prime contractors (like an airplane maker), the government claimant agency. In the case of a subcontractor, the company ordering the product.

**Q. Who authorizes production schedules for B products?**

**A.** The NPA industry division you file the application with. For production equipment that's the General Industrial Equipment Division.

**Q. If I make a product on the B list and file for an allotment, am I certain to get one?**

**A.** No, it's not certain. When all the requirements are in, the product you filed for may be knocked off the list for allocations.

**Q. Who decides which products are going to be granted authorized production schedules?**

**A.** The Requirement Committee of the Defense Production Administration decides how much materials the general programs will get. The claimant agency decides how it will be divided between end products.

# Under New CMP

**Q. When I apply for an authorized production schedule do I have to submit a bill of materials?**

**A.** Only if you are specifically requested to do so.

**Q. Suppose I'm a prime contractor. If a subcontractor of mine, acting on instructions, files a bill of materials with me, am I responsible for its accuracy?**

**A.** If you get a bill of materials that seems substantially too large, you are supposed to question it. If it is not satisfactorily explained, or reduced, you are supposed to report the matter to NPA.

**Q. If my production schedule is approved, how do I get an allotment of materials to fulfill it?**

**A.** Whoever authorizes your production schedule will, at the same time, make an allotment of materials sufficient to meet the schedule. Allotment numbers will show the quarter and the year for which the allotment is valid.

**Q. Okay—I get an allotment. That's a piece of paper. How do I get the materials?**

**A.** You write out an order to a producer or distributor for the controlled materials. The allotment number goes with the order. With it also goes a certification, stating that you are acting according to CMP rules.

**Q. Do I place the order with any supplier of my choice?**

**A.** Yes, unless your allotment instructs you to place the order with a particular producer.

**Q. CMP goes into effect July 1. Do I have to wait for allotments before placing orders for delivery beyond that date?**

**A.** No. You can order now and convert to an authorized CMP order by furnishing a revised copy after you get your allotment. Or you can furnish information clearly identifying the order and certifying that it conforms with CMP regulations.

**Q. Do producers and distributors of controlled materials have to accept all the orders they receive?**

**A.** No. Only up to the quantity limits specified for steel in NPA M-1 and M-6; for copper in M-11; for aluminum in M-5.

**Q. Is there any limit on the size of orders producers must accept?**

**A.** Yes. They can refuse orders for less than the minimum quantities listed in Schedule IV of CMP Regulation I.

**Q. How can I get delivery on an order that is less than the minimum producers must accept?**

**A.** First, try to get it from a distributor. If unsuccessful, you can order the minimum from a mill and specify what part of it is for an authorized schedule.

**Q. Can I place an authorized controlled material order with a distributor for future delivery?**

**A.** Yes, but the distributor may reject it if he chooses, and he's not supposed to set any material aside to fill the order later.

**Q. How much lead time do I have to allow producers of controlled materials?**

**A.** It differs by product. Schedule III of CMP Regulation I spells it out.

**Q. How much controlled material can I keep in inventory?**

**A.** For steel, what you would need for a 45-day period of operation. For copper and aluminum, the period is 60 days. There are a few exceptions, but this is the general rule.

**Q. What happens if I accumulate an inventory larger than CMP allows?**

**A.** The excess is subject to requisition. In general practice, you would just live off the excess until supplies were brought down to the CMP limits.

**Q. Will DO's be any good for steel, copper and aluminum in the CMP shapes and forms after CMP goes into effect July 1?**

**A.** Yes. Orders for controlled materials bearing DO ratings and calling for delivery before Oct. 1, 1951, must be filled by producers and distributors, subject to the same exemptions as apply to authorized controlled materials orders. CMP also continues the current practice of using NPA directives as the top method of allocating materials. If directives specifically say so, they will out-rank both DO and controlled materials orders.

**Q. What about DO's for materials other than copper, steel and aluminum in the controlled shapes and forms?**

**A.** You will continue to use them.

**Q. What about repair and replacement parts for civilian products not on the B list—like automobiles and other consumer hard goods?**

**A.** Applications should be filed for materials to make repair and replacement parts even if the product they are made for is not on the B list. Allotments will be granted.

**Q. What happens to maintenance, repairs and operating supplies under CMP?**

**A.** You will issue your own allotment for MRO supplies, as you do now. A special CMP regulation for MRO covers steel, copper and aluminum. Everything else remains under NPA Regulation 4.

## BUSINESS ITEMS

• **Cincinnati Milling & Grinding Machines, Inc.,** and **Cincinnati Milling Products Division** have moved their Chicago direct sales offices to larger quarters at 104 North Oak Park Ave., Oak Park, Ill. The new office, managed by Carl F. Stugard, will provide ample room for both field service and field engineers.

• **Bryant Chucking Grinder Co., Fellows Gear Shaper Co.,** and **Jones & Lamson Machine Co.,** all of Vermont, will open a new office and show room in Chicago, to be occupied jointly, about June 1. The newly constructed single story building is at 5835 West North Avenue.

• **Cleveland Automatic Machine Co.** has moved its New York district office from Newark, N. J., to Room 210 Ruskin Bldg., 75 South Orange Ave., South Orange, N. J. R. T. Carroll is district manager and Charles Locey is service engineer for the district.

• **Weisbecker Machinery Co.** is the new name of the former Rosenkranz, Weisbecker Co. of 149 Broadway, New York.

• **Reading Chain & Block Corp.,** Reading, Pa., has changed its name to Reading Crane & Hoist Corp., effective June 1, a name more descriptive of the company's operation.

# Role of Metal Powder in Defense Production Keynotes Annual Meeting

CLEVELAND—Metal powder's place in defense production was the unofficial keynote of the seventh annual meeting of the Metal Powder Association here April 25-26.

Opening with a description, by A. J. Langhammer, Amplex Div. Chrysler Corp. of the newly formed Powder Metallurgy Committee of the American Ordnance Association Shell Committee, the technical sessions included many phases of military manufacturing.

Of special interest to Metalworking were papers on infiltration of metal powder parts (George Stern of American Electro Metal Corp., described infiltration values found during development of Thompson Products metal powder turbine blades), metal powder applications in small arms ammunition (Col. G. A. Miller, Jr. of Frankford Arsenal), sintered iron rotating bands and cemented carbide cores for Ordnance use (A. M. Burghardt of Watertown Arsenal), powder metallurgy versus drawn wire for gear production (John Rigby, director, John Rigby and Sons, Ltd, Yorkshire, England), and metal powder applications for home appliances (J. D. Carey, General Electric Co., Bridgeport, Conn.)

Other papers described electronic and metallurgical problems.

• **Six million lb of iron powder** were used each month by the Germans for producing rotating bands for shells during World War II. Plans for the following year, interrupted by surrender, called for doubling this quantity. These bands were in smaller caliber only as German press capacity was limited to 6 in. dia. Estimates place our requirements considerably higher.

Present expansion is based on present requirements; not on all-out rotating band production. No shortage of present iron powder requirements is expected if desired facilities expansion is fulfilled.

Absolute specifications for iron powder rotating bands are not yet available. Proposed specs were submitted to the committee for review and analysis. Revised specifications are available in limited quantity; obtainable by writing to Roland P. Koehring, Powder Metallurgy Committee, American Ordnance Ass'n Shell Committee, Mills Building, Washington 6, D. C.

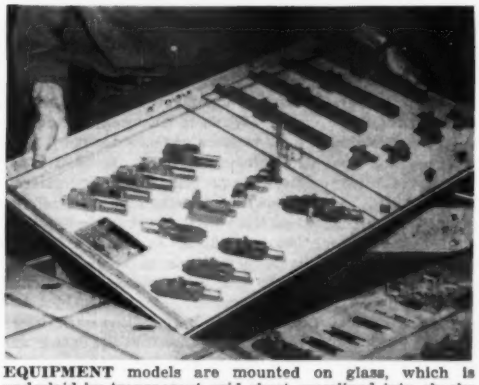
• **Metal powder jet engine** turbine blades manufactured at Thompson Products, Cleveland, are equal in fatigue life to 403 stainless steel as used side-by-side with 403. These blades outlast 403 in saltspray and other corrosion tests. Infiltration corrects for uneven density in compacts of varying thickness, as sections of greater porosity absorb more of the infiltrated material. Maximum density is still a requirement for maximum strength.

All military specifications are now being combined in a single series known as MIL specifications, according to Col. A. E. Mickelsen, chief, Munition Board Standards Agency, Department of Defense, as he spoke at the closing luncheon.

Many new structural parts of greater size and complexity were shown at the Metal Powder Show, together with new presses and other manufacturing equipment. Metal powder methods are taking a larger part in electronics manufacturing, particularly for magnetic and core materials. Popular feeling at the meeting was that metal powder methods would have a sizeable share in reducing production bottlenecks caused by machine-tool and materials shortages.

**THE METAL POWDER ASSOCIATION** elected new officers at the seventh annual meeting in Cleveland, April 25-26. Seated (left to right) are F. H. Milligan of Chas. Hardy and Sons, director MPA; W. P. Schenck of Alan-Wood Steel Co., chairman MPA; T. L. Robinson of Wel-Met Co., president MPA; E. H. Klein of New Jersey Zinc Sales Co., vice-president MPA. Standing are (left to right) R. P. Seelig of American Electro Metal, director MPA; R. L. Ziegfield, secretary-treasurer MPA; W. E. Cairnes of Radio Cores, Inc., director MPA

**WILLOW RUN PLANT** model includes every item of production even to the smallest workbench. Built on sectional tables, the model allows engineers to get to any one section for close work



**EQUIPMENT** models are mounted on glass, which is underlaid by transparent grid sheet crosslined into checks of ¼ in., each representing a sq ft of actual floor space

## Plant Models Speed Production

WILLOW RUN — When Kaiser-Frazer landed its Air Force contract to build the Fairchild C-119 "flying boxcar" cargo plane, it had a real plant utilization problem on its hands. With plane production facilities slated to take over one-third of Willow Run, that meant auto operations had to be moved out of the aircraft area, the remaining area had to be consolidated for maximum space utility, and assembly lines re-routed—all time-consuming operations under normal procedure.

K-F was able to speed up its production planning for this large-scale conversion by using a giant-size three dimensional table-top model of Willow Run and a unique labor-saving "grid system," illustrated here. By using this method, a plan can be authorized, and ten minutes later a blueprint turned out. To change the production setup, simply rearrange the models, turn out another blueprint.

**GLASS PANE** is inverted and grid sheet placed on top. Templates, scaled to fit machinery bases, are laid over locations indicated by inverted models

**GRID SHEET** with templates attached is laid on sensitized blueprint paper and run through Ozalid machine. Result is blueprint of production setup

## 350 Firms to Supply Parts For Chrysler Tank Engine Job

NEW ORLEANS—At the official welcome of Chrysler Corp. to this city, incident to its beginning of operations in the new tank engine plant here, R. S. Bright, general manager of the new plant, reported that components will be bought from about 350 different companies.

All major parts among the 7300 pieces of the engine will be machined at the plant. Castings and forgings will be bought outside, as will standard parts and engine accessories.

Bright reported that "a good percentage" of materials and parts to be bought from outside sources can be produced efficiently and economically in southern plants. A crew of expediters has been combing the south to establish sources. The desire for geographical centralization apparently stems from transporting economies.

## New Anti-Sub Bomber

BURBANK, Calif.—A new model of the Navy's P2V bomber, developed for anti-submarine warfare, has been announced by Lockheed Aircraft Corp. First of a substantial number of the new P2V-5 went to the Navy in April. Great Britain and Australia also will receive fleets of the P2Vs.

Large sections of the aircraft are subcontracted to several experienced aircraft manufacturers and delivered ready for assembly. On the P2V, Lockheed retains manufacture of the center and forward fuselage sections, including the flight and navigator stations.

## Reynolds Operates Adrian Plant

ADRIAN, Mich.—Reynolds Metals Co., Louisville, Ky., has taken over management of the Air Force's Manufacturing Methods Pilot Plant here. The plant has been under supervision of Gerity-Michigan Co. The $20-million government-owned and industry-operated facility will be used for developing forging and extrusion techniques and the proving of theoretical designs. No actual production will take place in the plant under contract with Reynolds, except in case of emergency. The plant is operated by Reynolds without fee or profit. Plant manager for Reynolds is C. J. Beneke.

**M. A. Hollengreen,** Landis Tool Co. president, and chairman of NMTBA government relations committee

**Richard E. LeBlond,** president of R. K. LeBlond Machine Tool Co. and president of NMTBA

# Materials, Price, Production

CHICAGO—The machine tool industry is "doing business literally in the dark." It doesn't know what materials it can get, what it can charge for its products, or how many machines it is supposed to produce.

The current situation in the industry "is one of complete chaos and confusion." The outlook for tomorrow is utterly unpredictable. The industry is ready to do the job that must be done, but it cannot plan intelligently until it knows the terms and conditions which it faces.

These thoughts, expressed by Richard E. LeBlond, president, R. K. LeBlond Machine Tool Co., as president of the association, keynoted the 49th spring meeting of the National Machine Tool Builders' Association at the Edgewater Beach Hotel, May 3-4.

Mr. LeBlond expressed doubt that any president in the history of the association was "so unable to outline what may happen tomorrow, as I am today." He said flatly that unless machine tool builders were given priorities to buy materials for all their output, whether rated or unrated, the industry could not expand as it should.

• **Washington seems** mysteriously unaware of the importance of machine tools to the present defense program, by contrast with the alertness shown in World War II, Mr. LeBlond pointed out. A month after Pearl Harbor the machine tool industry was offered certificates of necessity for plant expansion and was given pool orders accompanied by 30% cash. It had been granted blanket priorities long before that time.

The industry then was building machines at a rate of 110,000 units a year. When the Korean venture began, production was down to 34,600 machines a year. In 1951, Mr. LeBlond predicted, machine tool output will not exceed 56,400 machines, less than one-third the number (185,000) produced in 1941 before we were actually engaged in war.

"If real preparedness is our national concern," Mr. LeBlond asked, "why this preoccupation with prices? You and I know that the whole success of a tank or plane program may depend upon a handful of critical machine tools. Why worry about the prices charged for those machines, when the makers are subject both to excess profit taxes and to renegotiation? Why worry about price when the machines represent such an infinitesmal fraction of the production cost of the tanks and planes, but do govern the timetables as to how soon those tanks and planes can be produced?"

• **Unless the situation changes** sharply for the better, manufacturers of defense goods will be forced before many months have passed to admit publicly that they are unable to make deliveries as originally scheduled, Mr. LeBlond further predicted. Then they will blame their failure upon the machine tool industry, which will be labeled "the bottleneck" in the defense program.

Mr. LeBlond strongly urged in-

**Tell Berna,** general manager of the National Machine Tool Builders Association

**Marshall Smith,** director, Machinery Division, National Production Authority, Washington, D. C.

# Problems Face Tool Industry

dividual builders to write their representatives in Congress and people in government agencies concerned with machine tool production, telling their story of bafflement in their own way.

• **Reporting for the government** relations committee of which he is chairman, M. A. Hollengreen, president, Landis Tool Co., stated that the inability of the machine tool industry to meet the needs of the defense program is traceable to five obstacles: (1) Difficulty in holding trained men and in employing new men; (2) trouble in getting materials without a blanket priority; (3) delay in securing certificates of necessity to permit five-year amortization of investment in new facilities; (4) lack of money to finance larger inventories and increased manufacturing facilities; (5) uncertainty as to the price ceiling. In addition, some 20 machine tool builders went out of business in the lean years after the war, a serious loss of capacity in the industry.

Mr. Hollengreen emphasized that builders have had little luck in hiring men because they were in competition with the civilian goods producers who were expanding their plants, with new defense plants being started in cities in which the builders were located, and with much higher wage rates than they can pay. Some builders, in fact, have lost rather than gained manpower.

• **NPA's refusal** to give the vital machine tool industry a rating is especially hard to understand, Mr. Hollengreen charged, in view of the fact that it uses only about two-tenths of one percent of the nation's steel, just a little over 1% of anti-friction bearing production, and even smaller portions of other scarce materials. A machine tool builder who buys new materials for a lot of machines cannot possibly operate successfully under the priority system now in force.

Applications by machine tool builders for certificates of necessity have received scant attention in Washington, Mr. Hollengreen complained. For example, an application filed November 16 finally was issued April 12. No builder should go ahead, if he is using his own money for expansion of facilities, until a certificate of necessity has actually been granted.

Despite the fact that pool orders are temporarily stymied, Mr. Hollengreen predicted that eventually 75% of the industry will have them. The nature of pool orders is widely misunderstood, particularly the point that they are not intended to build up a pool or reserve of finished machines. While pool orders carry distinct benefits, they will not solve the machine tool builders' material problem. "Giving him a pool contract that will help him two years from now, he commented, "is like giving a drowning man a towel."

Mr. Hollengreen protested against the exclusion from the proposed ceiling price formula on machine tools of these increases in costs since Korea: (1) added insurance, (2) duplication of jigs, fixtures and patterns to expand output, (3) increased clerical help, except as included in factory labor, (4) multiple-shift operations, (5) training new help.

Washington seems to feel that overtime premiums, shift premiums and higher costs of subcontracting might be indulged in excessively unless some restrictions are imposed, Mr. Hollengreen stated. He said that distribution of part of the production load to many small plants which can make parts or subassemblies or complete machines is in the national interest.

• **Because of the price philosophy** in Washington, builders to an ever-widening extent have felt unable to accept orders, as they already have 18-months' backlog and have not known at what prices these orders must be delivered. Firm orders which builders are holding because they have been afraid to accept them probably amount to another five months' production, Mr. Hollengreen estimated.

Under CMP, machine tool builders will apply in tons for the amount of steel, copper and aluminum needed to make the machines which they plan to ship in the third and fourth quarters, Tell Berna, NMTBA general manager, explained in his report. After total requirements of the defense agencies and essential industries are determined, NPA will decide how much of the requested materials can be allowed each company.

• **If available materials permit,** NPA's Machinery Division will give each builder an allocation for both rated and unrated orders. But if allocations are not enough for the entire output, Mr. Berna said that builders are not to go into the open market to buy the rest. The material allocated can be ordered on DO rated orders, confirmed by an authorized controlled materials allotment, which takes precedence over DO orders not authorized under CMP. The DO number for these orders is not yet known.

With CMP allotments, builders will receive a priority to buy components needed to balance those allotments, if the supply permits, Mr. Berna stated. This is, in effect, the blanket priority for the builder's entire output for which NMTBA has been pleading since last Oct. 2. Incidentally, the builder should apply under CMP for material for subcontractors.

• **Unless steel allocated** under CMP is enough for builders' entire needs,

# Proposed 1952 Military Budget Asks $43 Billion for Procurement

WASHINGTON—President Truman sent his proposed fiscal 1952 military budget to Congress on April 30. It was a lot less than the figures the experts were predicting, just a couple of weeks ago. The new budget request is for $60.7 billion, about $43 billion of which is for procurement.

The new budget asks: $20.8 billion for the Air Force; $15.1 billion for the Navy; $19.8 billion for the Army; and $50 million for department of defense activities. It also includes a request for $4.5 billion for new obligational authority for public works, construction and acquisition of real property.

**Here's the breakdown:**

• $4.5 billion for public works—nearly double last year's $2.4 billion. Of this, Navy and Army will get $1 billion each, and the Air Force about $2.5 billion.

• Hard goods procurement in the amount of $29.7 billion—up $7 billion from fiscal 1951

• $5 billion in operation procurement (parts, components, fuels and lubricants)

• $2.3 billion soft goods.

• Research and development is now $1.5 billion as compared to $1.2 billion for the last fiscal year. This is still a substantial increase since the balance of last year's funds were appropriated during the closing months of the year. Spending is keeping pace with appropriations too.

Total expendiutres for fiscal 1951 were $19.4 billions. This year they will hit $39.5 billions.

**Here's Breakdown for Hard Goods Procurement**

| | (billions) |
|---|---|
| Aircraft | $14.5 |
| Ships and harbor craft | 1.9 |
| Tanks & artillery | 4.9 |
| Weapons | .5 |
| Ammunition and guided missiles | 2.7 |
| Electronics & communications equipment | 1.7 |
| Non-combat vehicles | 1.8 |
| Training equipment | .2 |
| Railroad construction and materials handling equipment | .4 |
| Expediting production | 1.1 |
| **Total** | **$29.7 billion** |

**NMTBA Meeting ... continued**

# Operation of CMP Explained to Machine Tool Builders

CMP will not permit the increase in machine tool production so vitally needed, Mr. Berna warned.

It will be necessary for each builder to segregate his orders for renegotiation purposes, Mr. Berna declared. Many contracts without renegotiation clauses still are subject to renegotiation. Conversely presence of such a clause does not necessarily mean that a contract is renegotiable.

Only part of the value of a subcontract for a new machine tool is subject to renegotiation, he asserted. Length of the defense program is assumed to be five years, for basis of such figuring with relation to the life of the machine. Full price of a cutting tool, on the other hand, is renegotiable if sold under a renegotiable contract or subcontract.

• **If delivery dates of critical** tools for production programs of our European allies cannot be met from the 30% under the M-41 priority system, it is possible that a decision may be made to allocate some machines from the military's 70%, Charles Baker, assistant chief, Machinery and Equipment Branch, Industry Division, ECA, said in a letter read to the members by Mr. Berna.

Mr. Baker stated that it is impossible to get a priority rating, except in extreme emergencies, for ECA-financed orders unless they are connected with the rearmament program. At this stage, it is not known how many of the commodities in foreign requirement program will be included in CMP. No matter what the setup for handling future foreign aid, personnel experienced in problems of Marshall Plan countries and southeast Asia will administer it.

Field engineers and salesmen should see that defense contractors get maximum production from equipment already installed, Donald M. Pattison, vice president Warner & Swasey Co. and chairman NMTBA committee on sales and service, told the members. These sales representatives can do these things: (1) assist the user to have machines properly retooled for defense work; (2) make sure that the customer buys the right number of machines, the right size, and proper tooling for maximum output: (3) see that honest delivery dates are established and if the required date cannot be met and a competitor is in a better position to meet it, point out that fact to the customer.

Mr. Pattison emphasized that "salesmanship should not take a holiday." It merely should shift its tactics and attack a new set of problems in a different manner. The sales refresher course scheduled for the summer of 1951 has been postponed, he said. However, a sales managers' conference is being considered to discuss, digest and help solve sales problems that will face management in post-defense period.

Marshall M. Smith, director NPA's Machinery Division, led a panel discussion of the machine tool industry's problems in connection with the defense program. Other members of the panel: P. L. Houser, deputy director Machinery Division; General Stewart Reimel and Captain E. A. Henning, both of the Defense Production Administration.

• **An association advertising campaign** to stress the machine tool modernization theme and the relationship of the government's depreciation policy to it was proposed by Frank W. Pensinger, advertising manager, Monarch Machine Tool Co., and chairman of the NMTBA committee on advertising. Advertisements would be designed to inform and influence government officials, members of Congress, industry, the financial community, editorial opinion, and "all thinking people generally." They would not be intended to supplant any part of a builder's individual advertising, but rather to make it more effective.

# New Handling Equipment Seen At Chicago Show

CHICAGO — Handling equipment that can play a vital role in boosting productivity and in aiding industry to meet the increasing demands of defense production was viewed here during the past week by thousands of metalworking executives who attended the fourth National Materials Handling Exposition held at the International Amphitheater April 30-May 4.

In the industrial truck field, a trend toward equipment for a greater variety of applications was apparent. Many exhibitors showed small, lightweight, and low-cost units designed to complement the operation of standard trucks. Included in this group were hand-guided powered trucks, both pallet movers and stackers; turret trucks; tractors; and platform types.

• **A general improvement in design** features of trucks and a further extension of the use of attachments were demonstrated by the Baker-Raulang line of trucks designed for speed and ease of maintenance, with unit sub-assemblies readily removable in a matter of minutes. Lewis-Shepard showed how a 2000-lb load on a 40x48-in. pallet could be stacked at right angles from an eight-foot aisle. At Automatic Transportation's exhibit, a new system for handling a forkless pallet was demonstrated. The pallet consists of inch-thick boards mounted in a pair of metal wings. Hooks on the truck carriage engage eyes on the wings to lift and carry the load.

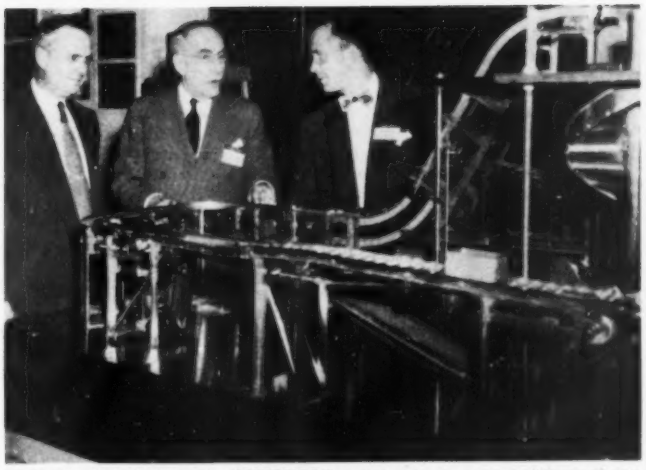
A new drive unit was shown by American Monorail Co. In this system, carrier wheels simply roll with the horizontal drive being obtained by a rubber tire spring-loaded beneath the rail. Carrier wheel wear is said to be greatly reduced.

• **Conveyor manufacturers,** including Standard, Mechanical Handling Systems, Inc., and several others, showed small loop systems displaying several of the basic conveyor types. Exhibits of this type also illustrate the fact that light, standard sections often can be integrated into a system that will be adequate for many simple applications at considerable savings in procurement time over what is possible when the conveying system must be engineered complete.

Improved containers and tote boxes were shown by several companies. One type that offers space-saving advantages is the steel collapsible box. Truscon Steel Co. exhibited a box in which all four sides hinge over the platform to produce a folded height of 3.5 to 4.5 in. over the platform. These can be stacked when empty.

Many large units primarily for yard or bulk handling were exhibited in an out-of-door area provided for the first time at the show.

Concurrent with the show, the American Materials Handling Society sponsored a conference on the technical phases of the subject.



**SEVEN FUNDAMENTAL CONVEYORS** included in Lamson model are shown by Carl F. Dietz, president, Lamson Corp. (center) to H. T. Bird (left), production control supervisor, and J. R. Stringer, foreman materials handling, Aircraft Engine Div., Ford Motor Co. Integrated in one system are pusher-bar booster, gravity, live-roll gravity (belt), two-plane chain, live-roll gravity (rubber-covered chain), belt, and spiral chute conveyors

**MATERIAL BOXES** that can nest, tier, or travel on trolley conveyor featured exhibit of Chas. Wm. Doepke Mfg. Co. Discussing boxes with C. W. Doepke (center) are J. W. Ferguson (left), plant layout and material handling engineer, Sealed Power Corp., and V. L. Miller, supervisor of stores

*More pictures of Materials Handling Show will appear next issue.*

# Names in the News

**Sailor E. Beer** has been named distributor sales manager, Monarch Machine Tool Co., Sidney, Ohio. He has served the firm in a variety of special sales capacities for the past six years. **Willis H. Kuhlman** was named to the newly created post of supervisor of Monarch Mona-Matic lathe sales. He has been a special sales and service representative for Monarch turning equipment since 1949. **Donald J. Harshbarger** has been transferred from the New York sales office to the Pittsburgh branch office. **Harry C. Hennequin,** who joined Monarch in December, succeeds Mr. Harshbarger in New York.

**I. W. Wilson,** senior vice president, has been elected president of Aluminum Co. of America, succeeding **Roy A. Hunt,** named chairman of the executive committe. **Arthur V. Davis** continues as board chairman. **Leon E. Hickman** was elected vice president and general counsel. Mr. Wilson joined Alcoa in 1911, became general superintendent of reduction plants in 1921, was named vice president in charge of operations in 1931, was elected a director in 1939, and senior vice president in 1949.

**Bruce A. Dean** has been elected sales vice president, Chase Brass & Copper Co., Inc., Waterbury, Conn. He was general sales manager, Mengel Co., Inc., Louisville, Ky.

**E. R. Almdale** has been named manager of the Michigan district for Carboloy Co., Inc., Detroit, succeeding **P. J. Jensen,** who has been called back to duty in the Detroit Ordnance district with rank of lieut.-col.

**J. Douglas Dawson** has been named general traffic manager, Norton Co., Worcester, Mass., succeeding **Elmer B. Jones,** retired. Mr. Dawson has been traffic manager, Abrasive Div., since 1946. **Robert W. Johnstone** was named credit manager, succeeding **John Miller,** retired. Mr. Miller will be retained as credit consultant and will assist the treasurer's office on financial problems.

**J. N. Candler** has been named vice president and assistant general manager, Morse Chain Co., a division of Borg-Warner Corp., Chicago. Mr. Candler was formerly administrative assistant to **F. M. Hawley,** president and general manager. **R. J. Howison,** formerly general sales manager, was named vice president, sales. **E. W. Deck,** formerly manager of the Ithaca plant, was named vice president, manufacturing — Ithaca. **M. V. Durkin,** former manager of the Detroit plant, was named vice president, manufacturing—Detroit.

**Robert C. Ross,** former vice president and director, has retired from Joseph T. Ryerson, Inc., Chicago.

**JUDGES PRESENT** William A. Dermody (second from left), president of Carlton Machine Tool Co., Cincinnati, with list of grand prize and honorable mention award winners in the Carlton Column Clamp Name Contest. Judges were Burnham Finney (left), editor of American Machinist; Charles E. Simpson (second from right), executive vice president, National Acme Co., Cleveland; and Wendell E. Whipp, board chairman, Monarch Machine Tool Co., Sidney, Ohio. Grand prize in the contest was split by R. L. Kessler, an assistant master mechanic from Indiana, and M. G. Gross, sub-foreman of Nofolk & Western Railway, Roanoke, Va. Mr. Kessler submitted "Rigidlok" and Mr. Gross "Rigid Lock" as a name for column clamp, sharing the top cash award of $500. The contest sponsored by Frank Moran, Carlton vice president and sales manager, attracted several hundred entries from all over the U.S.

**RALPH S. HOWE,** who was elected executive vice president of New Britain Machine Co., New Britain, Conn., as announced in AM, Apr. 30, p137.

**JAMES K. FULKS,** who was elected executive vice president of Ex-Cell-O Corp., Detroit, as announced in AM, Apr. 30, p136.

## OBITUARIES

**William Watson, Sr.,** 82, former vice president in charge of manufacturing at Allis-Chalmers Mfg. Co., Milwaukee, died Mar. 13. He was named general works manager of all tractor and general machinery plants in 1924, and was named vice president in 1932. He retired in 1941.

**Elmer J. Nooter,** 42, president of Nooter Corp., St. Louis, died Apr. 14.

**David C. Ball,** 93, organizer and chairman of Oakite Products, Inc., New York, died March 23. In 1909 he organized the Oakley Chemical Co., and later became its president. The company name was changed in 1926. He was named chairman in 1949.

**Joseph F. Fieg,** 74, factory manager of the Chicago Div. of United Screw and Bolt Corp., died March 22.

Gerry T. Attridge

John H. Daum

C. Denson Day

A. Charles Amann

**Gerry T. Attridge** has been named assistant general manager, Lovejoy Tool Co., Inc., Springfield, Vt. Formerly, he was chief development engineer. He has been with Lovejoy since 1946, and is repsonsible for design and development of the Lovejoy Type "S" milling cutter.

**David C. Prince**, vice president of General Electric Co., was recently named to the president's staff, with special duties as assigned. **Harry A. Winne**, vice president in charge of engineering policy, was assigned responsibility, formerly held by Mr. Prince, for the GE general engineering laboratory. **Ernest E. Johnson** was named to the new post of general manager of the laboratory. **Dr. Martin A. Edwards** was named engineering manager of the general engineering laboratory. **L. B. Gezon** and **O. A. Huntsman** have been named sales manager and assistant sales manager, respectively, of the metal-clad and switchboard section of the Switchgear Div. at Philadelphia. **E. W. Cunningham** has been named acting manager; Industrial Heating Div., at Schenectady, succeeding **Carl L. Ipsen**, who has accepted an advisory position with Machinery Div. of NPA.

**R. E. Lucey** and **H. C. Rooks** have been elected vice presidents of Trane Co., La Crosse, Wis. **E. A. Cline** was named sales manager. **R. E. Haskins** succeeds Mr. Cline as manager of convector-radiator sales. Mr. Lucey continues as manager of product development and chairman of the development committee. Mr. Rooks is a specialist in heat transfer work.

**Howard T. Shane** has been named sales manager, Shellcrease Div., Shelton Mfg. Co., Inc., Long Island City, N. Y.

**John H. Daum** has joined Harrington-Wilson-Brown Co., New York, machine tool distributors, as general partner and sales manager. He was formerly vice president in charge of sales, Giddings & Lewis Machine Tool Co., and before that executive vice president and general manager of Cincinnati Planer Co.

**C. Denson Day** has been elected vice president of Machinery Associates, Inc., Philadelphia, machine tool distributors. He was formerly sales manager of the Machine Div., Norton Co., Worcester, Mass.

**L. B. McKnight** has been named to the newly created position of executive vice president, Chain Belt Co. of Milwaukee. He joined the firm in 1927, has been a vice president and director since 1948. He is current president of the National Association of Conveyor Equipment Manufacturers.

**E. W. Ritter**, manager of Westinghouse Electric Corp.'s new Electronic Tube Div., has been named a vice president. **E. V. Huggins** has been elected executive vice president, Westinghouse Electric International Co. **William G. Marshal**, vice president in charge of industrial relations, has retired.

**Morse G. Dial** has been elected executive vice president, Union Carbide & Carbon Corp., New York. He joined the firm in 1929, became successively sales manager and general manager of the Pyrofax Div. Since 1949 he has been director, vice president, and treasurer.

**Wallace B. Phillips** has been elected president, Pyrene Mfg. Co., Newark, N. J., succeeding **Edward J. Waring**, retired. Mr. Phillips has been with Pyrene since 1913.

**A. Charles Amann** has been named general sales manager, Stamford Div., Yale & Towne Mfg. Co., New York, succeeding Meade Johnson. Mr. Amann was formerly industrial sales manager.

**J. C. Maezer**, factory manager, and **A. F. Jelinek**, chief engineer, were elected directors of Cleveland Automatic Machine Co. when the board was increased from seven to nine members. Mr. Jelinek has been with the firm for 33 years and was named chief engineer in 1944. Mr. Maezer joined the firm in 1929, became factory manager in 1945.

**Austin F. Logan** of Buffalo has been named by National Tool Co., Cleveland, as agent for western New York state. He has been active in sale and distribution of products in the metalworking industry for 15 years.

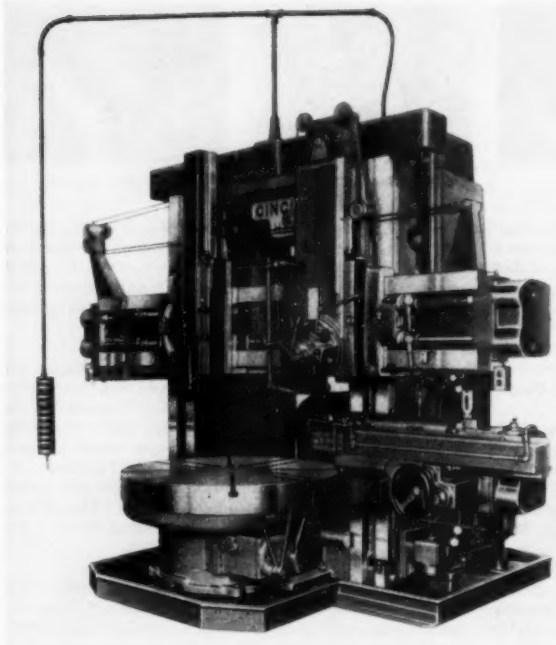
**Curtis Franklin** has been elected board chairman of Automatic Steel Products, Inc., Canton, Ohio.

**R. N. Hill** has been named vice president in charge of operations, Century Electric Co., St. Louis. **Joyce Pillsbury**, a director, was named secretary.

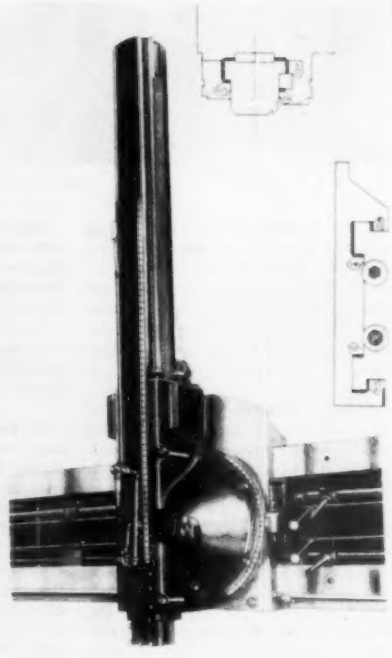
**Luke E. Sawyer**, executive vice president, has been elected president of Babcock & Wilcox Tube Co., New York, succeeding **Alfred Iddles**, elected chairman. **Isaac Harter**, formerly chairman, was named a consultant to the company. **Edward A. Livingstone**, vice president assigned to sales, was given broader organizational responsibilities.

**Ray E. Kalmbach** was named general manager, Wilson Foundry & Machine Co., Willys-Overland subsidiary.

# New Shop Equipment



Pendant station swivels to any position near rail and side heads on this Hypro vertical turning and boring mill. On single-shift-drive machines remote control of table speed is in the pendant. Head and rail control and start, stop, and inch functions are also in the pendant.



Helical rack and pinion on the ram is said to give smooth, even feed. Line drawings show non-metallic bearings on ram and saddle.

## Boring Mill Increases Accuracy, Capacity

Ten improvements in design feature these 54-, 64-, and 72-in standard and heavy Hypro vertical turning and boring mills. Increased accuracy and capacity plus greater ease of control are claimed.

1. **Helical rack** and pinion on the ram improve feed movements when threading or drum scoring. Fine adjustment is through hand cranks on the 54- and 64-in. machines and through sliding handles on feed shafts and rail screws on larger machines.

2. **Non-metallic** ram and saddle bearings are resistant to abrasion from metal dust, forging scale, and sand from castings. Their expansion factor for heat is much lower than metal with resultant less distortion and greater machining accuracy.

3. **Individual traverse motors** for rail and side heads mean direct power take-off and elimination of complicated drive shafts and transmission units. Result is reduced maintenance.

4. **Pendant station** swivels to any position near the rail and side heads. On gear-change-drive machines, head and rail control and start, stop, and inch functions are on the pendant. On single-shift-drive machines remote table-speed control is added.

5. **Selective positions** for the machine's 16 feeds are clearly marked on each head control unit. Any combination of head feed movements; up, down, in, or out is available through the control.

6. **Table transmission** shafts have anti-friction radial and thrust bearings. The case is an integral part of the sturdy one-piece machine bed. Heavy sections of the bed support the gear-train shafts. The gears run in a spray of filtered oil. Power is supplied through multiple V-belts.

7. **Gear changeover** in the feedbox has been simplified. The box is readily accessible and the gears are easily removed. 16 feeds are provided, from 0.003 to 0.500 in. on the 54- and 64-in. machines and from 0.004 to 0.750 in. on the 72-in. models.

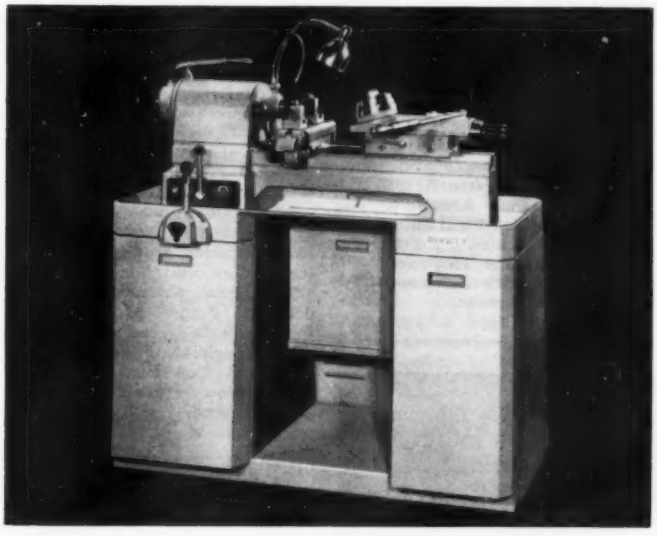
8. **Large taper roller bearing** offsets table radial thrust and a roller bearing track supports table and load. Greatly increased table speeds are said to be possible.

# Materials and Parts

9. **Mechanical-change** gear drives are available for any model. Table-speed variation is obtained through 16 gear changes in the main drive. Power is through a 1200-rpm, 40-50- or 60-hp ac motor depending upon needs. A similar drive but having 4 gear changes requires a 40- or 50-hp adjustable 3-to-1-speed dc motor for table speed variation.

10. **Single-shift** drive features 3 different electrical arrangements. With the 3-to-1 heavy-duty and the 6-to-1 extra heavy duty adjustable-voltage drives, table speeds from 20 to 1 in two separate ranges are possible. The third arrangement is the 6-to-1 adjustable-speed dc drive. All single-shift drives are controlled through the pendant.

*Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.*



## Cabinet Lathe Adds Speed, Power Becomes Turret Lathe

| | |
|---|---|
| Variable cutting speeds | 90-3750 rpm |
| Swing | 9 in. |
| Draw-in-collet capacity | 1⅛ in. |
| Stationary-collet capacity | ⅞ in. |

By adding power and speed to the basic accuracy of its cabinet lathe Rivett is said to have developed a turret lathe (the 918-S) with tool-room precision.

Controls are well grouped for selection of cutting speeds. Lever-operated clutch closer also controls spindle drive and brake. The spindle is mounted on grease-sealed ball bearings.

Collets have been improved to provide doubled bearing spacing—giving greater precision and increased gripping power. Closing of stationary collet is done without lateral movement in the spindle—thus scarring of stock is prevented. Self-aligning slide rest automatically squares itself with line of centers. The double-bevel steel ways are hardened and ground.

Automatic-indexing turret revolves on a ball thrust bearing that is preloaded. Opposed is a taper roller bearing that prevents vertical error. Indexing is accomplished through a pin that engages jig-ground holes in the index plate.

*Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass.*

### ...INCLUDING


**Engine lathe** with rapid traverse of carriage and cross-slide, each in 2 directions ..... page 182

**Injection molder** for plastics can be double stroked for stuffing more material into the injection chamber ..... page 182

**Duplex milling** machine moves head and table hydraulically, has 2 stations ..... page 183

**Perforating press** can punch alternate staggered rows by moving punch and die ..... page 184

**Gear shaver** employs semi-automatic loading utilizing an air-actuated tailstock ..... page 184

**Protection device** for presses can use 4 precision switches to safeguard tools or inspect ..... page 186

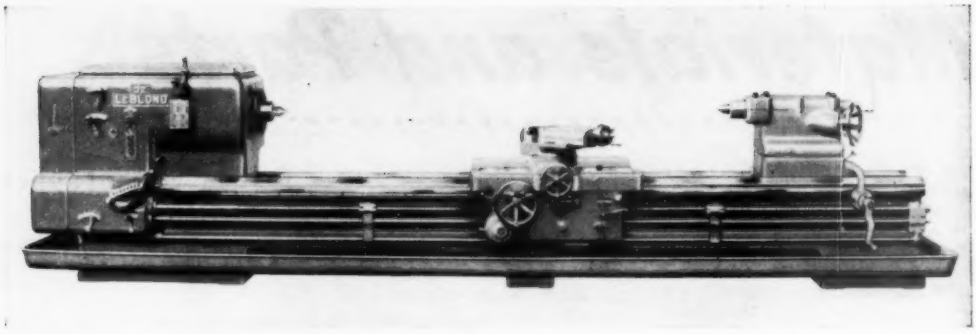
**Gear hobber** can cut bevel gears with straight teeth by using an attachment ..... page 190

**NEW BULLETINS for your Shop Library, including an 180-page catalog on steel stock in varying grades ..... pages 191 and 192**


### ...and in May 28

**Boring** and turning mill, said to be the largest built in the U. S., has safety friction clutches to guard against breakage.

**Assembly** machine puts the pins in connecting rods—if pressure required is too little, pin is rejected.



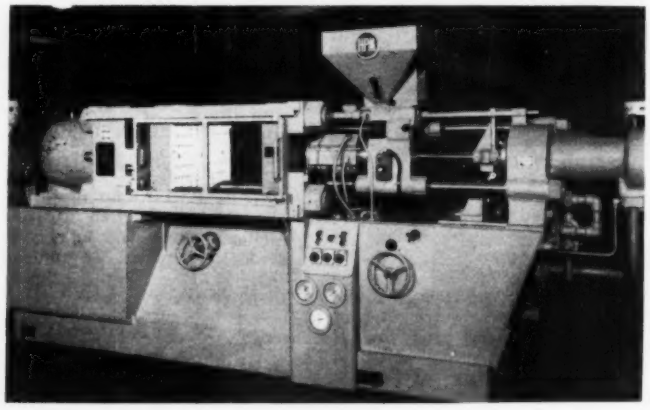
## Four-Directional Rapid Traverse Put in LeBlond Engine Lathe

| | |
|---|---|
| Swing | 34½ in. |
| 32 spindle speeds | 4-500 rpm |
| Feeds and threads | 48 |
| Feeds | 0.004-0.025 ipm |
| Threads | ¾-46 |

Fast traversing of carriage and cross-slide, each in two directions is possible on this 32-in. heavy duty engine lathe.

The lathe may be equipped for hydraulic (Hydra-Trace) or mechanical profiling. Other features include: totally enclosed quick-change box, hardened and ground steel bedways that are replaceable, and automatic lubrication through headstock, quick-change box, and apron. The headstock utilizes the free-running principle—only the gears actually needed are in mesh at a given speed, the remainder run free. No-load friction hp is thus minimized. The gears are steel, hardened and ground. The machine is arranged for 25-, 30-, or 40-hp motor, 1200 rpm.

*The R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio.*



## HPM Plastics Injection Molder Can be Double Stroked

| | |
|---|---|
| Maximum mold space | 17¼x26 in. |
| Daylight opening | 27 in. |
| Mold-clamp stroke | 18 in. |
| Capacity | 60 lb per hr. |

9-oz-shot machine can be double stroked for stuffing 40-50% more material into the injection chamber for larger shots. The mold clamp is hydraulically actuated by a large-area ram. A small, internal booster ram is also employed for fast closing.

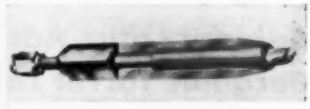
The hydraulic unit is completely out in the open for easy maintenance and service. Three adjustable automatic slow-downs—(1) just prior to mold contact, (2) during mold breakaway, (3) while injecting part—protect mold and molded parts from being damaged. It is claimed that by cutting rejects to less than 1%, the unit in one plant outproduced other comparative machines by more than 2400 parts per day.

The plasticizing chamber is equipped with a 2-zone heating system with cast-aluminum calrod heating units. Each zone is controlled by a pyrometer. The torpedo flange has a separate heating band with temperature controller.

Two radial, piston-type, variable-delivery pumps are connected through flexible couplings to a 20-hp double-end-shaft electric motor.

The machine can be factory equipped with a pre-plasticizing injection unit which will increase shot capacity to 20 oz. of polystyrene with plasticizing capacity tripled.

*The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.*



## Single-Unit Tool and Holder Permits Heavier Cuts

The Bar-Mor collet toolholder is said to have exceptional rigidity, permitting heavier cuts and faster feeds. It is also said to allow easy setting at constant tool height and free access to the work without disturbing setup.

Left- and right-hand turning, drilling, and the following jobs can be done with the tool:

Turning and facing: using a knife-edge or round-nose tool with hollow ground top, clearance is obtained by rotating the collet.

Boring: Set tapered front of tool

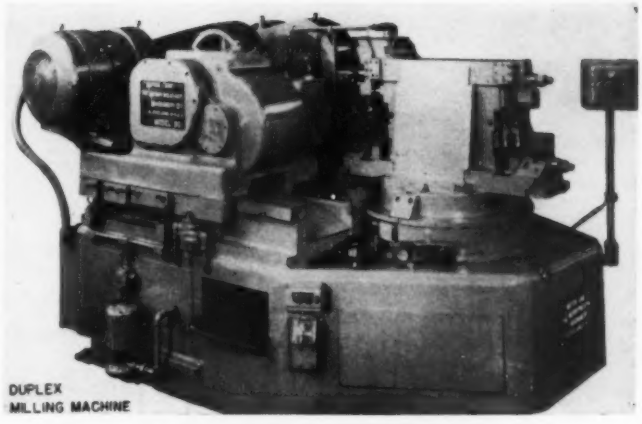
at slight angle for best cutting.

Internal screw cutting: Hold ground threading tool at required projection for accurate cutting.

Cutting a square thread: After grinding the collet to desired thread, the helix angle is obtained by rotating it.

The holder takes square and round tool bits, twist drills, reamers, and countersinks. When the collet is drawn into the holder it is gripped on all sides. It is said to maintain its position under all conditions because the taper on the collet head matches the internal taper at the front of the holder.

*M. M. Halpern Montgomery & Co., Inc., 53 Park Place, New York 11, N. Y.*



DUPLEX MILLING MACHINE

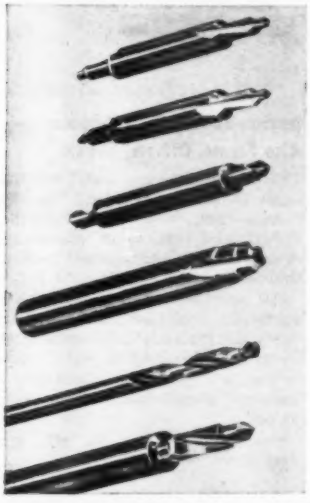
## Duplex 2-Station Machine For Face Milling

The work illustrated is the machining of tractor side bars with two mounted in each station. Production is rated at 268 pieces per hour, using carbide-tipped cutters.

A rotary indexing table carries 2 sets of workholding fixtures. While milling is taking place at the work point, the operator is loading and unloading the open fixture. The cycle is automatic—the table carrying the fixtures indexes 180° and is then clamped in position, the two opposed milling heads traverse forward, feed to an adjustable stop and rapid traverse return.

The heads can utilize up to 30 hp and have 2 in. of quill adjustment for cutter wear. Speed changes are made by pickoff gears. Movement of heads and table is hydraulic. Lubrication of all moving parts is automatic.

*The Motch & Merryweather Machinery Co., 715 Penton Bldg., Cleveland 13, Ohio.*

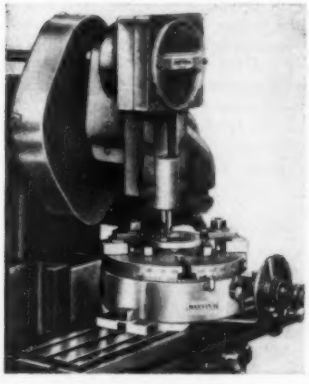


## W-S Counterbores and Step Drills Have Dia Tolerance of 0.0002 In.

Small counterbores and step drills made by Woodruff & Stokes have tolerances of 0.0002 in. on diameter and 0.0003 in. on eccentricity. They include: straight and angle shoulder; cutting and non-cutting pilot; single and double ended, from 2 to 5 cutting diameters; and straight and spiral flute. They are made of carbon or high-speed steel, or special alloy steels.

It is said a manufacturer of electric meters using a spiral-fluted double-ended step drill was able to perform three operations at one station. It combined centering, drilling, and countersinking with a tool cost of half the three tools it replaced.

*Woodruff & Stokes Co., 349 Lincoln St., Hingham, Mass.*



## Marvin Slotting Attachment Equipped With Chain Drive

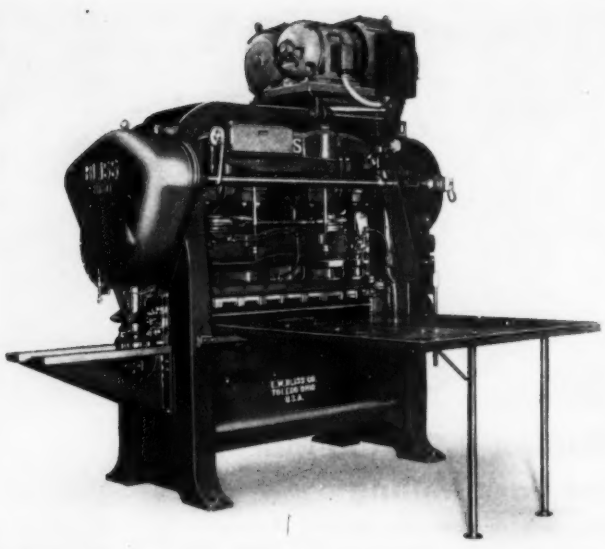
Roller chain on this attachment is said to eliminate slippage and allow heavy cuts. Protection for the operator is provided by a safety hood over the transmission. It can be set at angles to get draft in dies. Overhanging work can be handled by pulling the unit beyond the travel of the table.

It mounts on the overarm of a bench mill by attaching the chain sprocket to the spindle. No extra motor is needed. Machined to fit a 1½-in. overarm, it can be used on any size by employing a bushing or by turning down a special overarm. Sprocket for spindle has a 1-in. hole, which can also be remachined to suit other sizes. Stroke is adjustable from 0 to 2 in. and holder takes tools having a ½-in. shank.

*Marvin Machine Prooducts, Inc., 414 Ford Bldg., Detroit 26, Mich.*

**Rust preventive,** called No-Rust No. 6, protects metal surfaces against either indoor or outdoor exposure. It forms a thin film, covering 390 sq. ft per gallon. It is said to dry within 4 hours, and to not chip, crack, or scale.

*Gulf Oil Corp., 782 Gulf Bldg., Pittsburgh 30, Pa.*



## Bliss Perforating Press Can Punch With Stagger

The punching of slots, rounds, or ovals, either in straight rows or with alternating rows staggered can be done with this 150-ton press. The stagger motion is accomplished by feeding the sheet straight through the press but with the punch and die moving from side to side. The amount of stagger is adjustable. An attachment can be set to stop the press automatically after a predetermined number of rows have been punched. This is useful where blank spacings are required. An automatic safety device stops the feed before the tail of the sheet reaches the punching line, leaving any desired margin between the last row of holes and the edge. The press operates at from 100 to 200 strokes per min.

The feeding mechanism consists of entry and exit feed rolls of hardened alloy steel, driven by a feed crank adjustable for different feed increments. The stroke of the slide can be adjusted for different stock thicknesses.

A releasing mechanism acting on the upper rolls releases both rolls simultaneously. When installing die sets from front or back, the rolls can be slid on to a support bracket extending to the side of the press. A die can also be inserted through the uprights.

*E. W. Bliss Co., Canton, Ohio*

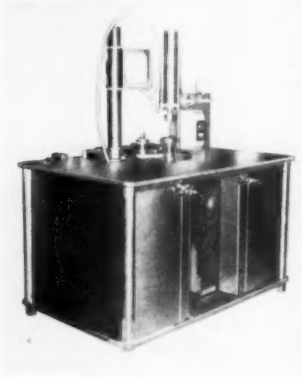
### Graham Portable Stud Welder

Once controls on this portable power unit are set for a job, the gun operates independently. The gun is safe—since it must be in contact with metal to weld stud.

The unit can be used wherever there is air pressure and electric power in 110, 220, or 440 ac available. The operator sets the air pressure control and adds or subtracts condenser capacity. The door in the front panel exposes 4 condenser connectors. It has a safety switch so condensers are discharged when it is open. Any combination of from 1 to 8 condensers can be made. Once the controls are set they remain constant.

The gun weighs only 2 lb. Portable unit on tires weighs about 800 lb.

*Graham Mfg. Corp., 1541 E. Eight Mile Rd., Ferndale 20, Mich.*



### Dayton-Rogers Shell Trimmer Also Forms, Offsets, Bevels

The Model 2-A not only flat-edge trims all drawn shells, but can also form, offset, bevel, bead, serrate, stencil, and other such operations. A universal tooling method reduces the cost.

All operations can be performed on drawn shells of practically any depth and from any sheet-metal stock up to and including 13 gage. Power is from a 3-hp, 1750-rpm motor. Air pressure needed varies from 20 to 80 psi.

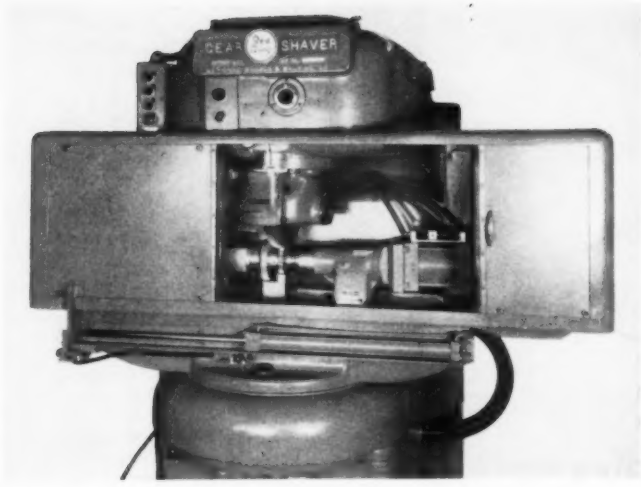
*Dayton-Rogers Mfg. Co., 2824 13th Ave., South Minneapolis 7, Minn.*

### Diamond Wheel-Dressing Tools

Each of these single-point tools contains one whole natural diamond, ranging from fractional to 3 carats. They can be used on any straight-face or form-wheel dressing operation and are said to be especially useful for shops where diamond usage is relatively low.

The tools are manufactured in a full range of sizes for all grits of grinding wheels.

*Christensen Diamond Tool Co., Detroit, Mich.*

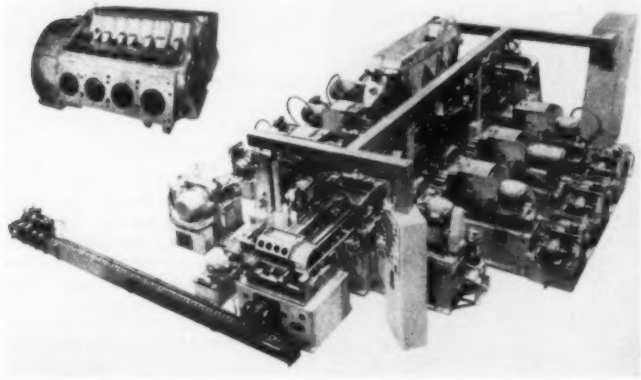



## Semi-Automatic Loading For Gear Shaving

Semi-automatic loading is accomplished on this gear shaver by an air-actuated tailstock, an automatic splash guard, and a prelocator and stripper which supports the work until it is engaged by the tailstock.

After the operator lays the work gear on the prelocator, he pushes the "start" button. This starts the automatic cycle. The splash doors close, the tailstock advances to engage the work, the coolant flow starts and shaving begins. At the end of the shaving cycle the cutter stops, the coolant flow stops, the tailstock retracts and the splash doors open. Thus, all that is required of the operator is putting the work gear on the prelocator and removing the shaved gear at the end of the cycle.

*National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich.*



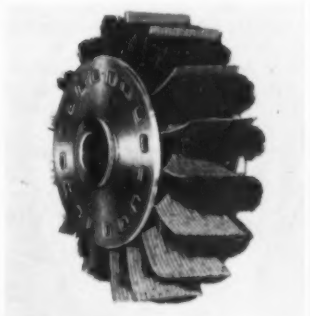
**TRANSFER MACHINE performs 83 drilling operations on the ends and angle surfaces of a V8 automotive block. It is arranged so that production can continue without any of the individual units. Single operations at any one station can also be done. This arrangement is said to be very effective in reducing production losses from breakdown, tool changes, etc. It is operated by one man at the central control station.—*Barnes Drill Co., 814-830 Chestnut St., Rockford, Ill.***

### Small Air Cylinder For Jigs and Fixtures

The Han-D-Air cylinder was developed primarily for use in jigs and fixtures and for parts ejection and positioning. It has a power factor of 1:1, developing a thrust equal to the applied air pressure. It has a $1\frac{1}{8}$-in. bore, 1-in. stroke, and is single acting with a spring return.

It can be mounted in practically any position: front flange, rear flange, side, foot, or front pivot. The 5/16-in.-dia piston rod has a $\frac{1}{2}$-in.-long threaded end to simplify installation.

*The Bellows Co., Akron 9, Ohio.*



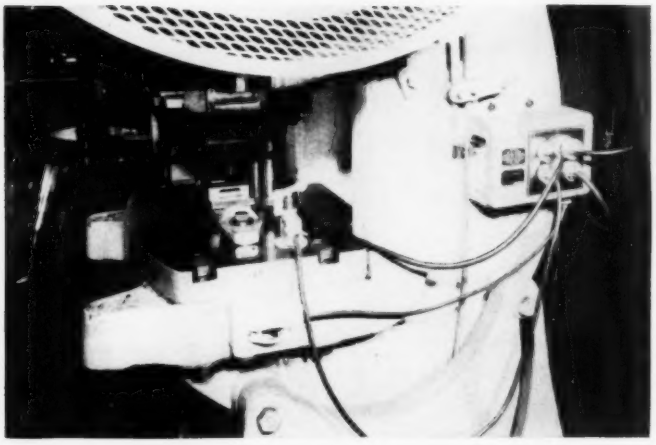
### Portable Polishing Head Combines Abrasive Cloth, Brushes

Two parts make up this head: an outer shell or drum, holding 16 replaceable brushes, and a center spool on which are coiled 16 strips of abrasive cloth. The brush bristles allow the strips to ride over projections but forces them into depressions.

The central cylinder of the head has 4 anchor pins for securing 4 abrasive assemblies—4 strands per assembly—making up the 16-strand loading. It is rotated within the outer frame to coil the abrasive strips within the head and to release new cutting surfaces.

The head is made in 4- and 2-in. widths.

*The Vonnegut Moulder Corp., 1819 Madison Ave., Indianapolis 25, Ind.*

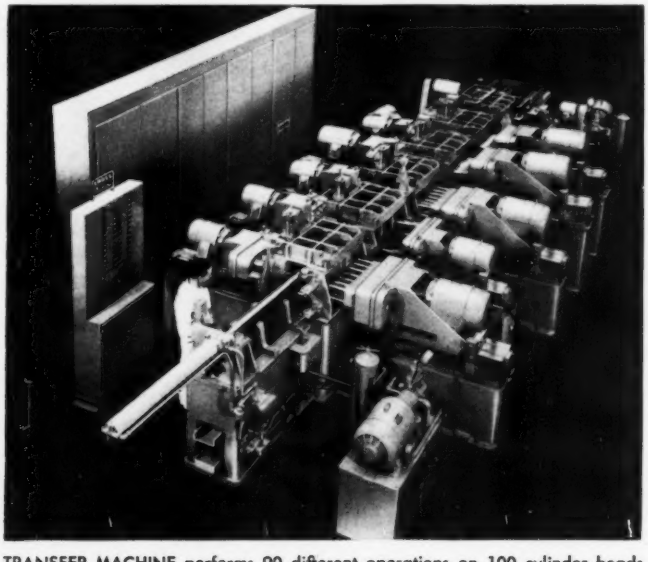


## Protection Device Safeguards Tools and Dies or Inspects

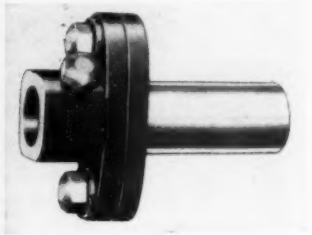
The Multi-stop is a 4-plug control unit to which Microswitches can be connected. Some of its applications in press work are as follows: protecting dies and the press from breakage, stop machine automatically at the end of a coil or strip, stop machine if stock buckles between feed unit and die, stop machine if thickness or width of stock varies, stop if short feed occurs.

As an illustration, supposing it is desired to automatically shut off the press when the end of the stock is reached. The precision switch would be mounted between the straightener and the roller check. As the end of the stock passes through, the switch deenergizes a solenoid which disengages the clutch on the press. The ram is stopped at the top of its stroke.

*U. S. Tool Co., Inc., Ampere, N. J.*



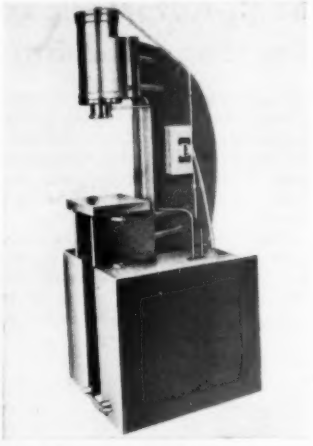
**TRANSFER MACHINE performs 90 different operations on 100 cylinder heads per hour. The work, which includes drilling, spot facing, and tapping, is done at 8 stations. Clamping is performed hydraulically. A circulating coolant system cleans and lubricates the taps while they are retracting. A conveyor moves chips to a central disposal point. —*The Cross Co., Detroit 7, Mich.***



### Canfield Floating Holder

The No. 00 floating holder is a non-releasing model for use on hand screw machines and turret lathes. For taps, it is made of hardened, polished steel. Price—$4.00 each.

*Canfield Screw Machine Co., Stratford, Conn.*



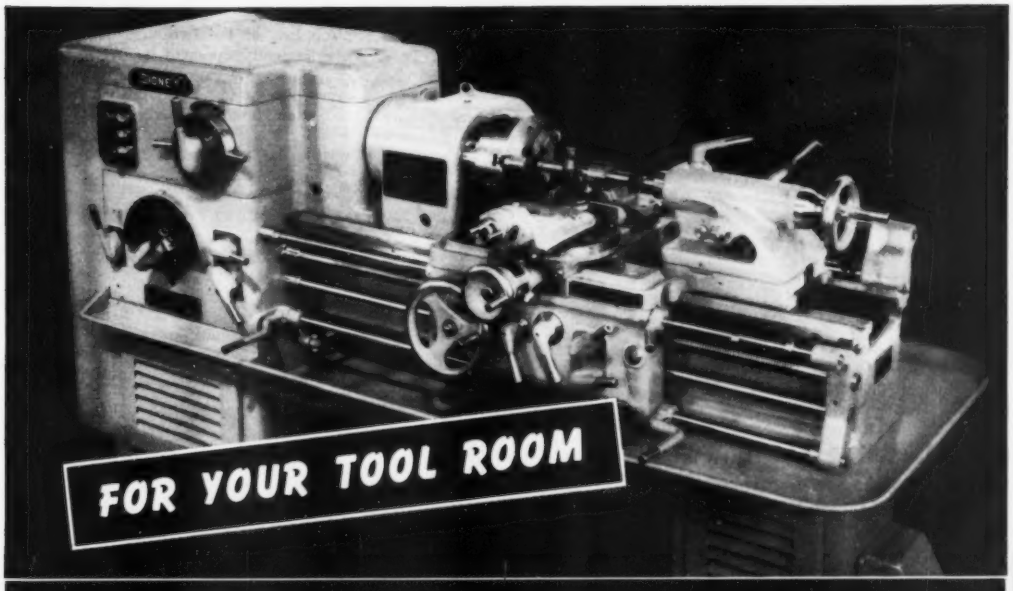
### Ross 20-Ton Hydraulic Press

| | |
|---|---|
| Throat | 8 in. |
| Ram travel | 12 in. |
| Retracted ram clearance | 16 in. |
| Ram speed, down | 60 ipm |
| Ram speed, up | 90 ipm |

Assembling, broaching, crimping, drawing, forming, laminating, riveting, and general forcing operations can be performed on this motor-driven, double-acting press.

A vane pump activates the ram with a pressure of 1250 psi. Control of the ram is through a pedal. The press is a steelwelded structure except for the cylinder, which is a Meehanite casting. The power unit is contained in the base—making a portable unit.

*Ross & Co., 1401 E. 57th St., Chicago 37, Ill.*




# SIDNEY Universal Relieving Attachment

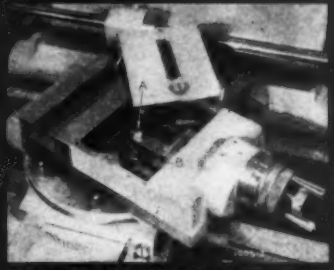
Here is an entirely new development which has many advantages over the conventional relieving attachment.

It is adaptable to Sidney Lathes already in the field as well as to new machines and incorporates a 4 to 1 spindle speed reducer integral with the change gear housing thus eliminating the need for 2-speed motors or other costly devices to reduce spindle speed. Universal joints have been eliminated entirely. A timer arrangement enables the operator to pick up any relief at any point with a minimum of effort. A clutch lever is provided to disengage relieving attachment for conventional turning.

This attachment will handle plain external relieving, spiral relieving, form relieving, end relieving and internal relieving.

For complete details write us or contact a Sidney representative.

Rear view showing change gear housing with conveniently located index plate.



Illustrates adjustable cam throw. Additional cams are not required to obtain various throws.

**SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO**

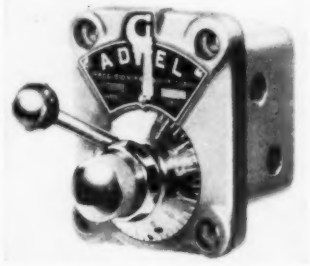
*Builders of Precision Machinery Since 1904*

## Hand Truck with Hydraulic Lift

One man can lift, move, and stack a 500-lb load by means of the hydraulic lift in this hand truck. Barrels, boxes, and castings can be lifted as high as 54 in.

The lever-operated hydraulic ram is connected to the lift pallet by means of a chain and sprocket. Each stroke of the lever lifts the pallet 1¼ in. A pedal controls the lowering of the load—descent can be stopped by releasing the pedal. Truck wheels are of aluminum with molded rubber tires.

*Allied Manufacturing & Sales Co., 4700 Rice St., Chicago 51, Ill.*




## Adel Hydraulic Control Valve Maintains Constant Flow

Valve for inlet pressure of 1500 psi is compensated to maintain almost a constant flow regardless of variation in inlet and outlet pressure. It is adjustable from completely shut-off position to 25-gpm maximum flow in the largest size.

Maximum recommended outlet pressure equals the inlet pressure of 1500 minus 100 psi. No drain line is required. The wide range of control-lever rotation (270°) permits accurate flow settings. Eight models are available. In ⅜ in. pipe size—1, 2, 4, and 6 gpm flow maximum. In ¾ in. pipe size—10, 15, 20, and 25 gpm flow maximum.

*Adel Div., General Metals Corporation, 10777 Van Owen St., Burbank, Calif.*

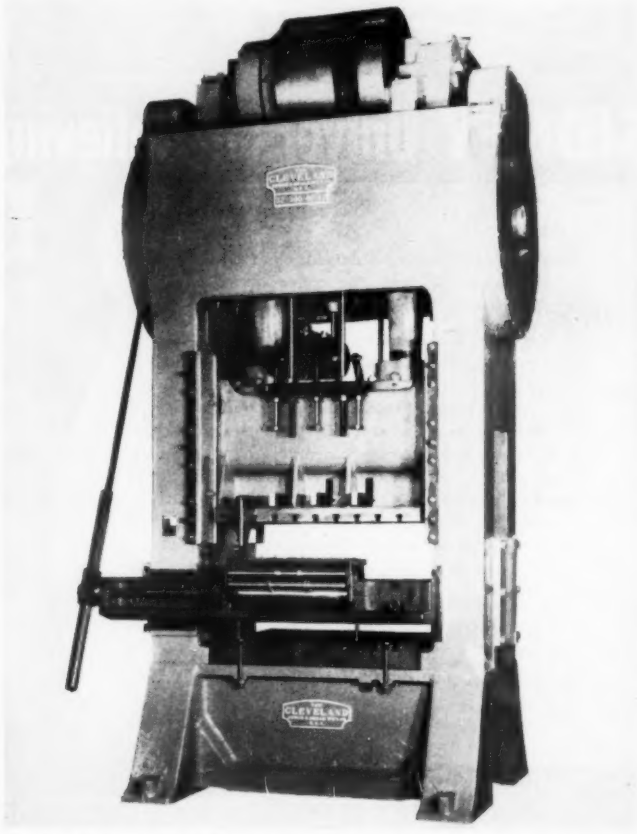
## Internal Thread Comparator Measures From Pitch to Pitch

This instrument measures from the pitch line of any one thread to the pitch line of the two threads lying diametrically opposite it. When set to a basic ring gage, the comparator gives plus or minus deviations from the basic pitch. The reading is in tens of thousandths, and for any one setting, the instrument has a range of plus or minus 0.003 in. Threads in deep holes are measured as readily as those located near the mouth of an opening.

The ring-gage setting automatically compensates for any wear of the gage members which contact the workpiece. Therefore, the instrument need not be replaced or reconditioned frequently to maintain accuracy.

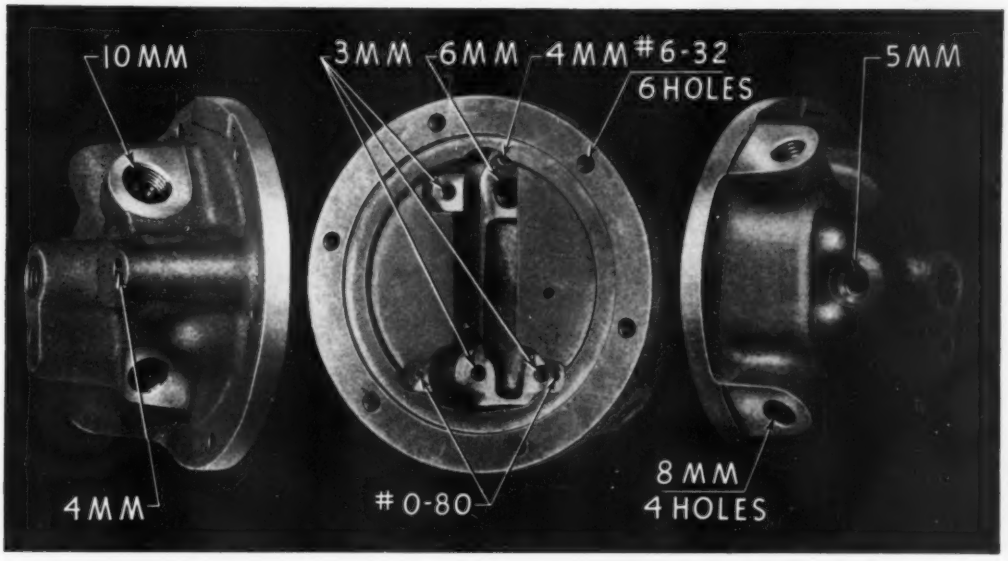
The comparator is available for measuring NC threads ½ in. –13 to 4 in. –4 and NF threads from ½ in. –20 to 1½ in. –12.

*Rimat Machine Tool Co., Glendale 1, Calif.*

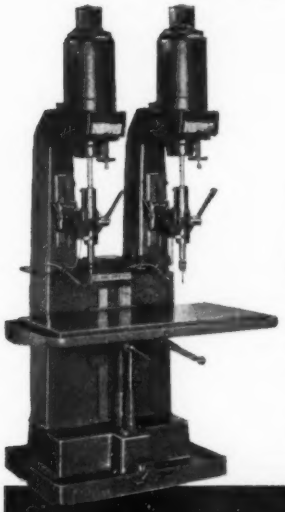



TWO-POINT PRESS, the 2S-300-60-42, is double-geared with twin drive. Electrically controlled, air-operated drum friction clutch has a spring-loaded brake. The press is equipped with a single roll feed and pneumatic die cushion. Stroke is 12 in., slide adjustment 8 in., rpm 22, and capacity 300 tons.—*The Cleveland Punch and Shear Works Co., Cleveland 14, Ohio*

# *Can you top this for tapping?*




***All these gas tight, fine thread holes tapped as routine production***



## *by* AMERICAN GAS ACCUMULATOR COMPANY
### *on a* LELAND-GIFFORD
### *No. 2-LMS Reversing Motor* DRILLING MACHINE

Lighthouses, airway beacons, airport lights . . . to assure unfailing operation of these vital units, American Gas Accumulator Company of Elizabeth, New Jersey, builds them with instrument precision. Shown here is only one of many critical parts tapped by AGA on a standard Leland-Gifford No. 2-LMS Drilling Machine with reversing motor control for tapping.

Note the range of sizes — all the way from *#o-80* (pitch dia. 0.0519″) to *10 mm.* (pitch dia. 0.3554″) — in tough Navy Bronze with all tapped holes gas tight. The same machine, incidentally, is used to tap full depth ¾″-14 Whitworth pipe threads (1.063″ OD). Between tapping jobs — with a flick of a switch and a quick tool change — it does double duty as a drilling machine — accurate, sensitive and with a wide range of spindle speeds.

Think what a production drilling machine like this could do for you in your shop or toolroom . . . tough jobs made easy, time saved, costly operations made profitable. Look into it today. Write for complete information.

**PRODUCTION MEN**
*Get This Handy Slide Rule*

**A valuable aid in figuring costs and setting production schedules. Quickly gives time required to drill holes of any size and depth in any material. It's free. Write the nearest office.**

# LELAND-GIFFORD
## *Drilling Machines*

WORCESTER 1, MASSACHUSETTS, U. S. A.

CHICAGO 8, 565 W. Washington Blvd.; DETROIT 26, 1533 Dime Bank Bldg.; CLEVELAND 1, P. O. Box 5547; NEWARK 2, Industrial Office Bldg.; ROCHESTER 4 Commerce Bldg.; LOS ANGELES 14, 724 So. Spring St.

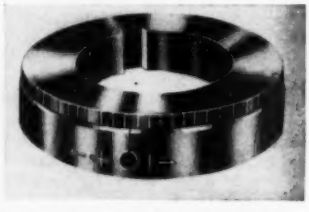
## Cleco Pneumatic Countersink Has Built-In Lubricator

Weighing 18 lb. in smaller sizes and 19 lb. in larger sizes, the Airmatic countersinks in all types of sheet metal, including 27-ST and 75-ST aluminum and alloy steels. In aircraft plants, for example, it can be employed in countersinking spars and other structures that receive dimpled skins.

The over-all time cycle for countersinking a ⅜-in.-dia hole in 75-ST aluminum is 9 sec. Capacity ranges from 5/16- to ⅝-in. hole diameters with metal thicknesses to 1¼ in. It is manufactured in six sizes.

Mandrels for varying hole diameters and countersinks can be changed rapidly, without dismantling the tool. A built-in micrometer gives accurate adjustment of the countersink.

*Cleco Div., Reed Roller Bit Co., Houston 1, Texas*



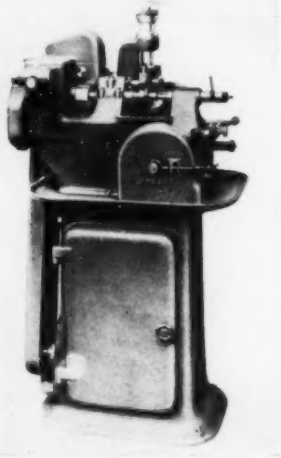
## Dayton-Rogers Adjustable Collars Space Cutters to 0.00025 in.

These collars make it possible to space milling-machine cutters on the arbor to 0.00025 in. by graduations on the outer micrometer sleeve.

Final spacing of the collars is done after the first trial cut. The cutter arbor nut is loosened with adjustment made through the directional plus or minus indicator, using a furnished spanner wrench.

The collars are made out of an alloy steel that will take arbor-nut pressure up to and including 25 tons. Standard sizes range from ⅝ to 2½ in.

*Dayton-Rogers Mfg. Co., 2824 — 13th St., S. Minneapolis 7, Minn.*



## Teeth Inclined to 18° Can be Cut on Gear Hobber

| | |
|---|---|
| Minimum dia of gears cut | 5/64 in. |
| Maximum dia of gears cut with hob of 0.9449-in. dia | 3.470 in. |
| with hob of 1.260-in. dia | 3.149 in. |
| Max. length hobbed, straight gears | 1.969 in. |
| with inclined teeth (18°) | 1.181 in. |
| Max. module | 1.5 |
| Number of teeth | 4-390 |
| Speed of hobs | 214-380-550-940 rpm |
| 10 feed speeds | 0.075-0.80 mm |

Semi-automatic gear hobbing machine of Swiss make can cut gears with straight teeth, with teeth inclined up to an angle of 18°, worm wheels (cut radially), and, with a special attachment, bevel gears with straight teeth.

Known as the Lambert Type 75, the machine has automatic radial and longitudinal feed. The combination of radial and longitudinal movement shortens the over-all stroke with a corresponding increase in production. Time savings as high as 50% are claimed.

*Carl Hirschmann Co., 30 Park Ave., Manhasset, N. Y.*

## Three Tool-Bit Materials To Fit the Application

Available in stock in standard sizes for immediate delivery, Gorham ground tool bits and turning tools can be obtained in three materials.

They are: Standard, for the commercial field M-40-B, a super moly grade for heavy-duty turning; and Gormet, for turning soft or abrasive stock at high speeds. Ground cutoff blades, in 17 stock sizes, are also available in the standard material.

Gormet combines a cast mixture of chromium, cobalt, and other semi-rare metals rather than steel. They are more brittle than HSS and cut better when hot—no cooling lubricants should be used.

*Gorham Tool Co., 14400 Woodrow Wilson, Detroit 13, Mich.*

## No Dies or Bronze Powders Used In Metallic-Bronze Lacquers

Particle size in these lacquers is controlled by rigid selection of raw materials to give maximum luster and reflectivity. Complete dispersion of pigments is claimed. Another feature is that "casting of shadows" has been eliminated. Color and reflectivity are said to be always the same when viewed from any angle. It is further claimed that the lacquers are non-caking, non-jelling, and relatively free from settling out.

Fifteen shades are included in the standard line with other colors supplied on special order. Standard colors include various shades of Old English, Antique, Statuary, Gold, Copper, Brass, etc.

*National Lacquer and Paint Co., Inc., 7415-39 S. Green St., Chicago 21, Ill.*

## W-S Hollow Mills Hold Concentricity Within 0.0005 in.

These small hollow mills are not stock items; they are designed and manufactured to meet specific requirements. They have on OD of ⅝ in. and under.

Machined of carbon, HSS, or special alloy steels, the mills may be plain or adjustable, with internal or external steps, for left- or right-hand screw-machine work. They are specially heat-treated for long life and made to tolerances dictated by the customer.

*Woodruff & Stokes, 349 Lincoln St., Hingham, Mass.*

# FYI

## FOR YOUR INFORMATION

### *FREE Catalogs, Booklets, Charts, Calculators*

**FYI**—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

#### MACHINES AND ATTACHMENTS

**1** BORING—*Chicago & Lowis Machine Tool Co., Fond du Lac, Wis.* 12-page catalog on attachments and accessories for horizontal boring machines. Purpose, typical applications, structure, features, and specifications are covered.

**2** DIE CUSHIONS—*Danly Machine Specialties, Inc., Chicago 50, Ill.* 20-page booklet on die cushions for mechanical presses gives sizes, capacities and dimensional data. A feature is a series of selection charts covering a wide range of sizes and types.

**3** FEED TABLE—*The Bellows Co., Akron 9, Ohio.* 12-page bulletin T-50 describes a rotary air-operated feed table, shows installations, and gives specifications.

**4** BENDING BRAKES — *Drive & Krump Mfg. Co., Chicago, Ill.* 12-page bulletin P-51 covers steel power bending brakes and universal pan and box brakes. The machines are illustrated and described and specifications are given.

**5** SURFACE GRINDERS — *Harig Mfg. Co., Big Rapids, Mich.* 12-page bulletin illustrates and describes Nos. 12 and 100 rotary automatic surface grinders. Photos show special fixtures developed for each job.

**6** CUTOFF MACHINES—*Modern Machine Tool Co., Jackson, Mich.* 12-page bulletin on automatic and manual machines for cutting off tube and bar stock. A complete description of the machine and its parts plus specifications are given.

**7** FACE GRINDER — *Samuel C. Rogers & Co., Buffalo, N. Y.* 4-page bulletin describes the NT-36 face grinder that features an automatic oiling system, magnetic chuck, and a reversible V-way.

**8** GEAR SHAVING—*National Broach & Machine Co., Detroit 32, Mich.* 8-page bulletin describes the operation of diagonal gear shaving and the machines for this work.

**9** PUNCH PRESSES—*L & J Press Corp., Elkhart, Ind.* 4-page folder catalogs all of the company's presses. Includes diagrams of the lower cams and specifications.

**10** BULLDOZERS—*Williams-White & Co., Moline, Ill.* Catalog sheet gives specifications and describes a line of mechanical bulldozers with air-operated clutches.

**11** GEAR HOBBERS — *Carl Hirschmann Co., 20 Park Ave., Manhasset, N. Y.* 6-page folder on a gear hobber shows how savings are effected through automatic radial and longitudinal feed.

#### TOOLS AND ACCESSORIES

**12** DIE SYSTEMS—*Connecticut Tool & Engineering Co., Bridgeport 5, Conn.* Standard parts, master drill jigs and master die sets make up this system for making economical short-run dies. 40-page booklet illustrates and describes the system and gives typical applications.

**13** CUTTERS — *Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill.* 44-page stock and price list gives quantities available for immediate delivery. All tools have specifications and are illustrated.

**14** SOLID-CARBIDE TOOLS—*Regmec Mfg. Co., Inc., Detroit 1, Mich.* 12-page catalog illustrates and describes grinding tools, rotary files, burrs, end mills, drills, center taps, and reamers.

**15** TOOLHOLDERS—*Ready Tool Co., Bridgeport 5, Conn.* 8-page booklet covers spring toolholders of all types and sizes including threading, forming, and cutting.

**16** CUTTERS—*Severance Tool Industries Inc., Saginaw, Mich.* 12-page catalog describes midget mills, dovetailing cutters, counterbinks, tail-end reamers, and chamfering mills. Includes specifications.

**17** CHUCKS—*Erickson Tool Div., The Erickson Steel Co., Cleveland 14, Ohio.* Catalog J describes bullet chucks, adjustable and floating holders, tap chucks, air-operated speed chucks and air cylinders, expanding mandrels, speed indexers, and boring and reaming tools.

#### HEAT-TREATING AND WELDING

**18** WELDING STAINLESS — *The McKay Co., Pittsburgh, Pa.* 48-page manual describes all phases of stainless-steel arc welding. Includes: specific uses of alloying elements, the AISI analyses, anal-



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Company .....
Co. Address .....
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AMERICAN MACHINIST, New York

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# FYI FOR YOUR INFORMATION

this range, color guide, and tensile data on stainless.

**19** FURNACES—*Johnson Gas Appliance Co., Cedar Rapids, Iowa.* Catalog 51 illustrates and describes a line of burners; furnaces for hardening, tempering, and annealing; valves; torches; mixers; and blowers.

**20** SILVER-BRAZING ALLOYS—*All-State Welding Alloys Co., Inc., White Plains, N. Y.* Folder gives 6 "don'ts" and 5 "don'ts" of sound procedure when using the company's silver brazing alloys.

## PLANT-SERVICE EQUIPMENT

**21** AIR CONDITIONING — *Westinghouse Electric Corp., Pittsburgh 30, Pa.* 14-page catalog describes all the equipment needed for air conditioning; cooling, heating, filtering, ventilating, etc.

**22** IMPREGNATING CASTINGS — *Standard Co. of America, Chicago 24, Ill.* 4-page bulletin explains the equipment used in what is claimed to be a low-cost method of eliminating casting porosity.

**23** TRACK TRUCK—*Wesson Corp., Harvey, Ill.* Bulletin describes the Trackmobile, a shop truck that can travel on road or on railroad tracks. Principal use is in spotting railroad cars. Has large drawbar pull for weight.

**24** FLOOR RESURFACING — *The Monroe Co., Inc., Cleveland, Ohio.* 2-page bulletin describes a material over which traffic can roll 60 min after application.

**25** LIFT TRUCKS—*Towmotor Corp., Cleveland, Ohio.* 4-page folder pictures and describes standard accessories, special load-supporting mechanisms, and other non-standard equipment for lift trucks.

**26** BLAST CLEANING — *Pangborn Corp., Hagerstown, Md.* 4-page bulletin describes the Turn-Style table for airless blast cleaning.

**27** STRADDLE TRUCK—*Hyster Co., Portland, Oregon.* Catalog features the model MHS, of 30,000-lb capacity and especially designed for handling steel.

**28** DUST CONTROL — *American Wheelabrator & Equipment Corp., Mishawaka, Ind.* First issue of "Industrial Ventilation," a periodical on dust and fume control. This issue contains case histories on the application of cloth-tube filters.

## PARTS AND MATERIALS

**29** STEELS—*David Smith Steel Co., Inc., Brooklyn 36, N. Y.* 120-page catalog lists steels in every size, shape, and form. Includes mathematical tables and other technical information.

**30** WORKING ON STAINLESS—*The Babcock & Wilcox Tube Co., Beaver Falls, Pa.* 104-page booklet describes NEW stainless Croloy tubing steels, deals with their manufacture and inspection, corrosion and oxidation resistance, and methods of fabrication.

**31** POWER BRUSHES — *Pittsburgh Plate Glass Co., Baltimore 27, Md.* 16-page booklet gives 13 case histories of different applications of the company's power-driven brushes.

**32** RETAINING RINGS—*Waldes Kohinoor, Inc., L.I.C. 1, N. Y.* 16-page bulletin 8 covers a series of retaining rings to take up and take out components for varying tolerances and wear.

**33** BALL BEARINGS—*Miniature Precision Bearings, Inc., Keene, N. H.* 12-page catalog on miniature ball bearings contains specifications on more than 70 different types and sizes and details on typical applications.

**34** STAINLESS STEELS — *Armco Steel Corp., Middletown, O.* 16-page booklet describes the properties, available forms, and fabrication of Armco 17-4 PH and 17-7 PH stainless steels.

**35** INDUCTION MOTORS—*Westinghouse Electric Corp., Pittsburgh 30, Pa.* 12-page booklet summarizes the types and features of the two basic induction motors (squirrel-cage and wound-rotor) and shows where they fit into industry.

**36** MAGNESIUM—*The Magnesium Association, New York 17, N. Y.* 6-page folder tells the story of the metal, gives its advantages and applications.

**37** TUBING STEELS—*The Babcock & Wilcox Co., Beaver Falls, Pa.* 8-page bulletin gives technical information on the design and fabrication of tubing employed at high temperatures and pressures.

**38** POTENTIOMETERS—*Minneapolis-Honeywell Regulator Co., Brown Instrument Div., Philadelphia 44, Pa.* 16-page catalog covers electric control units for contact and proportional control of, for example, furnaces.

**39** FORCE INDICATORS — *Hunter Spring Co., Lansdale, Pa.* 4-page bulletin describes and gives specifications on 12 models of a force indicator.

**40** CONVEYOR CHAIN—*Chain Belt Co., Milwaukee 1, Wis.* 4-page bulletin covers a new type of chain, with a flat top that can still flex in two planes and pass around sharp corners.

**41** PULLERS—*Templeton, Kenly and Co., Chicago 12, Ill.* 8-page bulletin shows labor-saving applications of hydraulic pullers and jacks. It introduces 2 new units and includes specifications.

**42** PLASTIC PIPE—*American Hard Rubber Co., New York 17, N. Y.* 16-page catalog gives engineering data on tubing, pipe, valves, and fittings of Ace-Saran and Ace-Perlon (polyethylene) plastics.

**43** ENAMEL—*The U. S. Stoneware Co., Akron 9, Ohio.* 4-page bulletin describes a new Nubian 600 enamel finish paint. Includes instructions for applying.

## MISCELLANEOUS

**44** FLINT WASTE—*Henry Disston & Sons, Inc., Tacony, Pa.* 16-page booklet includes 10 pages illustrating "Flint Waste" cards available from the company. Each card (or page) tells how to use a tool, what causes may reduce its performance, and what should be done to prolong its life. The other 6 pages describe a simple waste-prevention plan.

**45** SPINNING—*Symmes, Inc., Middlesex 3, Vt.* 16-page booklet tells what can be done with a combination of metal spinning and fabricating. Includes many examples of spinning jobs.

**46** PACKAGING—*American Furniture Co., Milwaukee 12, Wis.* 16-page brochure shows how many varied products can be packaged, gives specifications, and features of the company's line.

Reader Service Department
American Machinist
330 W. 42nd St.
New York 18, N. Y.

Place 3¢ Stamp Here

Reader Service Department
American Machinist
330 W. 42nd St.
New York 18, N. Y.

Place 3¢ Stamp Here

# WAX LUBRICANTS !

## Can greatly improve lubrication on even the most difficult metal forming and cutting jobs...Try them!

### JOHNSON'S WAX LUBRICANTS

**offer new metal working possibilities for ferrous and non-ferrous metals**

Wax has proved its ability to do many metal lubricating jobs conventional lubricants cannot do.

Wax Lubricants have so improved lubrication during deep drawing, cold heading, tapping and cutting operations, especially on the difficult metals where oils become fugitive, that galling, tearing, die wear, welding of metal to tools, etc., were virtually eliminated. Wax Lubricants are clean, easily degreased and adaptable to any type of application. They will resist temperatures up to 550° F.

### JOHNSON'S WAX LUBRICANTS

- **Permit multiple draws with one application**
- **Increase time interval between tool repair**
- **Increase die life**
- **Decrease rejected and damaged pieces**
- **Provide lubrication under extreme heat**
- **Protect parts and tools against corrosion**

*Write for details concerning the use of Johnson's Wax Lubricants for your specific jobs. Give them a production test.*

#### DRAWING STAINLESS STEEL

Production runs on thousands of pieces of No. 405 stainless drawn to the shape shown at the left proved that wax as the lubricant permitted drawing the metal far beyond its theoretical capacity and eliminated tool wear to such an extent that it could not be measured by micrometer.

#### COLD HEADING STAINLESS STEEL

Wax, used as the lubricant on stainless steel wire before it entered the cold heading machine, permitted far better fill-in of shoulders during the upsetting operation. Tests on waxed stainless wire offer evidence that copper flashing for lubrication purposes is unnecessary.

#### SHOE BENDING ALLOY TUBE

Wax used as the lubricant in the shoe bending of hard alloy tube reduced the required bending pressure by one-half, and eliminated the loss due to crimping and buckling.

#### LUBRICATING SELF-TAPPING SCREWS

A special wax blend adopted by screw manufacturers for lubricating self-tapping screws provided as much as 50% torque reduction with the improved lubrication.

**S. C. JOHNSON & SON, INC.** *Industrial Products Department AM5, Racine, Wisconsin*

## Drillpress Head Used as Chuck On Sherman Induction Brazer

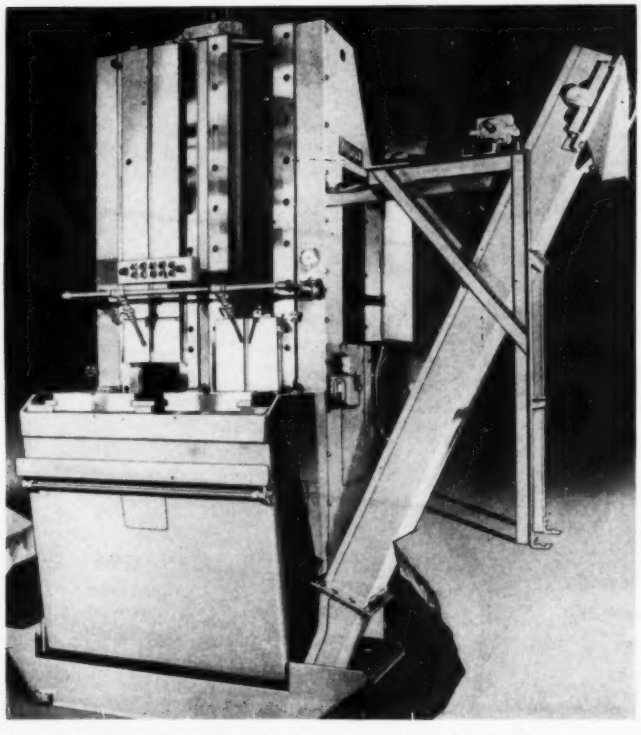
This machine is said to provide a quick setup for brazing, soft soldering, or heat-treating moderate-size parts.

It has a heavy steel table that bolts on the front of the company's standard induction heater. A modified drillpress head is used as the chuck. The mechanism is reversed so that its spring load holds the work down against the anvil. A variety of simple workholding fixtures can be secured and centered in it. It is not necessary to rotate the work.

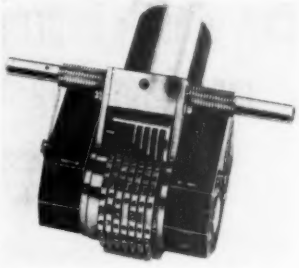
In the photo, the fixture is a flat disk with three pins to locate and hold a brass candy dish while it is being brazed to a center stud held in the lower anvil. The heating coil is located just below the work. The height and lateral position of the fixture head can be varied. The support table is equipped with a 1-in.-deep flange edge and has fittings for water and sewer hoses. Heating coils bolt to the front of the machine and can be changed in 30 sec.

Operating controls are at the top front of the unit. A load meter shows directly the percentage of full load. Output frequency is in the megacycle range; supply is 220 v, 60 cycle, single phase. The machine handles both steel and brass work.

*Sherman Industrial Electronics Co., 505 Washington Ave., Belleville 9, N. J.*



TWO BROACHING MACHINES, Type-XD, double-slide, with 30x66-in. stroke are being used to machine the sides and keyways of track links. All chips are automatically removed from each machine base by a General Conveyors Corp. continuous conveyor driven by a 1-hp. 1200-rpm electric motor and speed reducer. Conveyor-chain speed is 13.8 fpm. Chips are carried to a hopper on the floor level.—*The Oilgear Co., 1563A W. Pierce St., Milwaukee 4, Wis.*

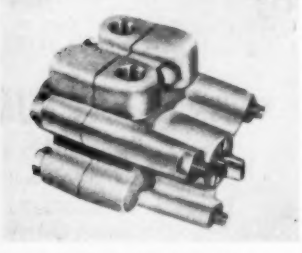


## Automatic Numbering Heads For Punch-Press Stamping

Standard heads permit numbering from 1 to 9999999999 in Sharp-Face Gothic characters and can be used on any material. Heads in Flat-Face Gothic or Shaded Roman are recommended for brass or other soft metals. A duplicating attachment can be added if required.

Direct reading is possible on the larger heads. The machine setting can be determined from engraved numbers on the front of the lettering wheels.

*The Parker Stamp Works, Inc., Hartford, Conn.*

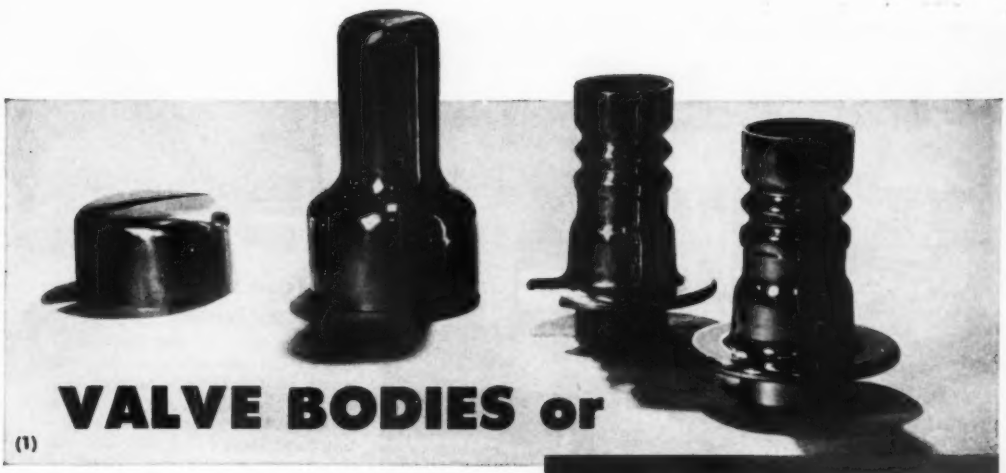


## Compact Pump Made by Eco

The compact size of this pump (3 9/16 in. long) allows it to fit in small-size cabinets. Known as the M-3, it pumps 1.65 gpm at 1750 rpm, operating against pressures as high as 150 psi at the higher speeds.

It is constructed of naval-bronze forgings; has eccentric pistons; bearings do not require lubrication; and it will pump in either direction. Available with or without flange-mounted motor.

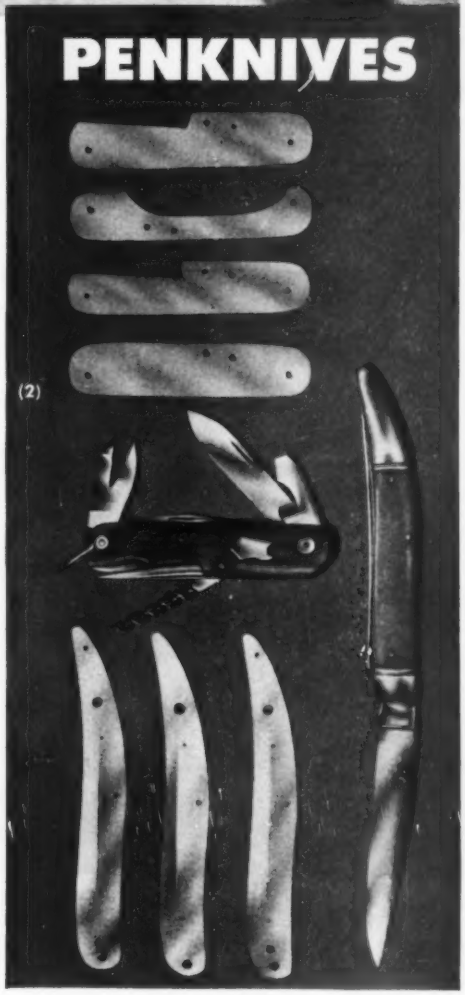
*Eco Engineering Co., 12 New York Ave., Newark, N. J.*



# VALVE BODIES or PENKNIVES

(1)

(2)



## How Two Manufacturers Improved Their Products . . . Pared Their Production Costs

**(1)** This illustration shows only four steps in the manufacture of a valve body from Revere 70-30 Cartridge Brass by Eastern Tool & Stamping Co., Saugus, Mass. Eastern was asked to quote on making this body as a stamping, to replace a casting. Due to the design of the part, it was felt that it would be especially difficult to produce from brass strip. Hence Revere was asked to collaborate on specification and fabrication. A close study of the fabrication steps resulted in the recommendation of 70-30 brass in a certain grain size. The latter is kept under control by Eastern through only two intermediate anneals. The result is a most unusual drawn and formed part, lighter, better, and more economical than the former casting. (Revere has no objection to castings as such. The important thing is to use them only if they are more economical and satisfactory.)

**(2)** Penknives, fisherman's knives and similar items made by the Utica Cutlery Company, Utica, N. Y., contain liners of brass which provide the proper clearances between the blades. These not only have to be blanked to the proper shape, but also must be punched with small holes for the rivets. Some of the holes must be "punched clean" with a minimum amount of burr. Others are produced with a blunt punch so that the metal is extruded slightly around each hole. The Revere Technical Advisory Service was consulted, with the result that Revere now supplies brass in a temper which blanks cleanly, but which also produces the exact amount of extruded metal around the desired holes in the customer's operation. In this case, it was proper temper which eliminated rejections and added to the quality of these already fine knives.

• These two cases are typical of the results obtainable when Revere and a customer sit down together to share their knowledge with each other. In these times, when more and more companies are planning to switch to Defense Orders, such collaboration can be exceptionally valuable. May we work with you?

**REVERE** 150TH YEAR OF SERVICE TO AMERICA

**COPPER AND BRASS INCORPORATED**

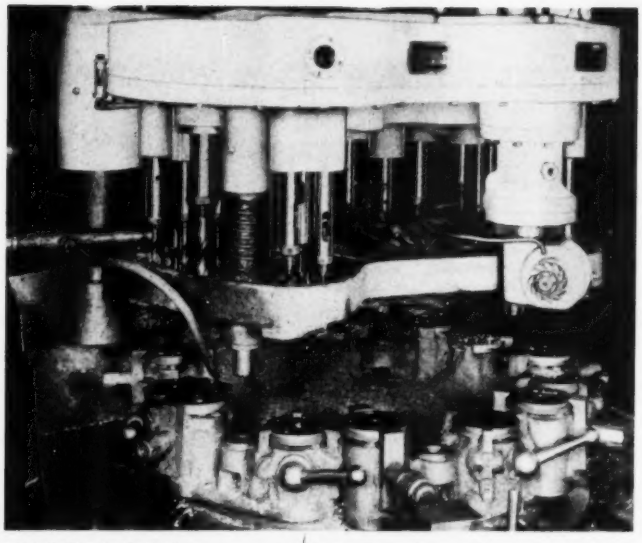
*Founded by Paul Revere in 1801*

230 Park Avenue, New York 17, N. Y.

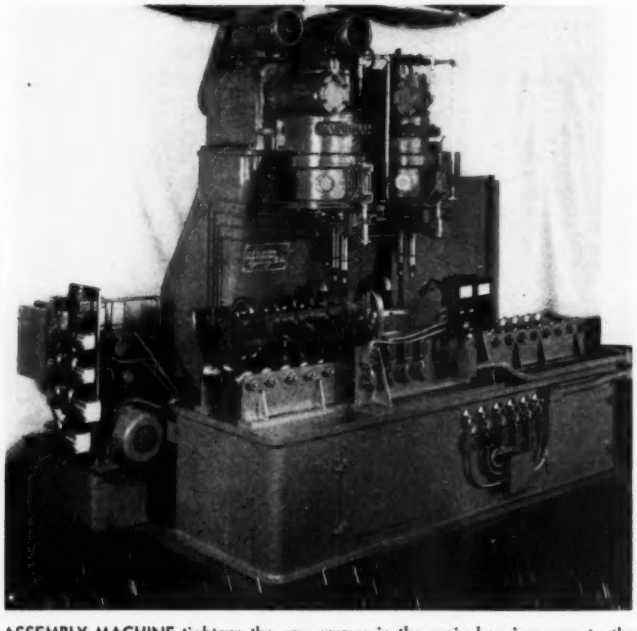
• • •

*Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.*

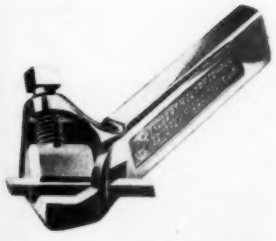
**SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY**



**34-SPINDLE DRILLHEAD** has suspended bushing plate and an oil-circulating pump. Compressor parts, of pressure-molded cast iron, are held in an 8-station rotary indexing table while they are drilled, reamed, countersunk, trepaned, and milled. Each spindle turns at a speed suitable for the operation it performs, varying from 127 to 2000 rpm.—*Thriftmaster Products Corp., 1016 N. Plum St., Lancaster, Pa.*



**ASSEMBLY MACHINE** tightens the cap screws in the main bearing caps to the cylinder blocks of auto engines. One motor drives the two spindles, with 170 ft-lb torque taken off and divided through differential gearing. Thus 85 ft-lb (± 1) is applied to each screw. Production is 42 blocks per hour.—*H. E. Farmer Engineering Co. Inc., 624 McKerchey Bldg., Detroit 1, Mich.*



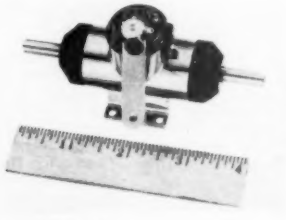
## Jaw on Clark Adjustable Toolholder Exerts Equal Pressure

Vise-grip jaw in this toolholder exerts equal pressure over the full length of the cutter channel. This is said to eliminate any possibility of the toolbit rocking, thus permitting faster feeds and deeper cuts. The screw-operated jaw can adjust to several sizes of toolbits—square, oversize, round, and out-of-round.

The holders, are drop-forged, heat-treated and hardened. Other features are: a tilted head giving the operator a clear view of the cutting edge, and a protruding underlip which prevents breakage.

The holders are available in both standard 15° channels and with parallel channels for carbide bits, threading tools, and boring bars.

*Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif.*



## Lever Controls Miniature Variable-Speed Drive

This drive is especially useful for remote or automatic control. By applying linkages or cams, a wide variety of means of control are possible. The actuating lever carries a pointer which indicates the ratio setting on top of the unit.

Speed is adjusted through the lever by changing the radius at which rollers make contact with disks.

Known as the 4B, the unit has ratings up to 2-lb-in. of torque, 0.025 hp, 20,000 rpm, and an infinitely variable speed ratio ranging from 1/6 to 6.

*Metron Instrument Co., 432 Lincoln St., Denver 9, Colo.*

# Hjalmar Ellstrom

## *INVENTOR OF THE GAGE BLOCK*

The achievement of perfection . . . the complete mastery of any art or craft or science . . . is a rare human accomplishment. A discovery or an invention that contributes to the progress and total welfare of all mankind is rarely the heritage left by a single man. So rare is it, indeed, that in such infrequent instances, the true facts surrounding its origin are often distorted, obscured, or even lost in the conflicting claims of others who would seek the personal worldly gains to be derived from undeserved fame.

So it was with the Gage Block. For, actually, this basic standard of measurement now used the world around was originally conceived, developed, and invented solely and entirely by . . . Hjalmar Ellstrom.

Here, briefly, is the story of his accomplishment: During the early 1890's, Hjalmar Ellstrom was employed by the government rifle factory at Eskilstuna, Sweden. He was a master craftsman . . . a man of infinite patience who took great pride in his work. He was a man of vision, too, who recognized the limitations imposed upon industry by the lack of sufficiently accurate measuring devices. So, with a then unheard of standard of precision as his ultimate goal, he alone developed and perfected his checking instruments and techniques . . . then alone he created the world's first gage block accurate to the infinitesimal millionth part of an inch.

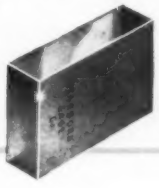
Today, though his achievement has been copied and imitated by others, his personal unqualified devotion to accuracy is the exclusive heritage of Ellstrom.

**ELLSTROM** . . . *measuring in millionths for three generations*

**DEARBORN GAGE COMPANY**

22035 BEECH STREET • DEARBORN, MICHIGAN

*Originators of Chromium Plated Gage Blocks*



## Electronic Frequency Measurer Is Accurate to 0.05%

Electronic instrument known as the 6T-4 Stroboconn measures frequencies from 32.703 to 4186 cycles per sec. to an accuracy of 0.05%. Measurement is accomplished by stroboscopic means. It can be read directly without computations. Some of its uses are measuring rotative speeds and transient vibrations, and calibrating oscillators.

*C. G. Conn, Ltd., Elkhart, Ind.*

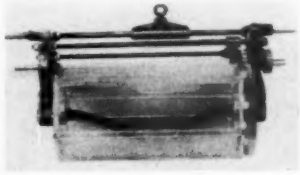
## Aluminum-Alloy Rivet has Shear Strength of 38,000 psi

The high shear strength of these rivets combined with a wide temperature range for driving is said to make it possible to replace steel rivets (with resulting better corrosion resistance) in many aluminum structures. Joints now employing aluminum rivets can be reduced in complexity and bulk with the stronger rivet.

The wide heating range, 850-975 F, is especially advantageous in field work. The driving pressure decreases as the temperature increases within the range. During preparations for driving, the rivets should be heated in air and soaked within the specified range for 15 min. The rivets are available in ½-, ⅝-, ¾-, ⅞-, and 1-in. sizes. It is possible to drive each of the sizes, except 1 in., with a hand-operated pneumatic hammer. All sizes can be squeeze driven.

Known as the XB77S, it is being offered on an experimental basis.

*Aluminum Company of America, 801 Gulf Bldg., Pittsburgh 19, Pa.*

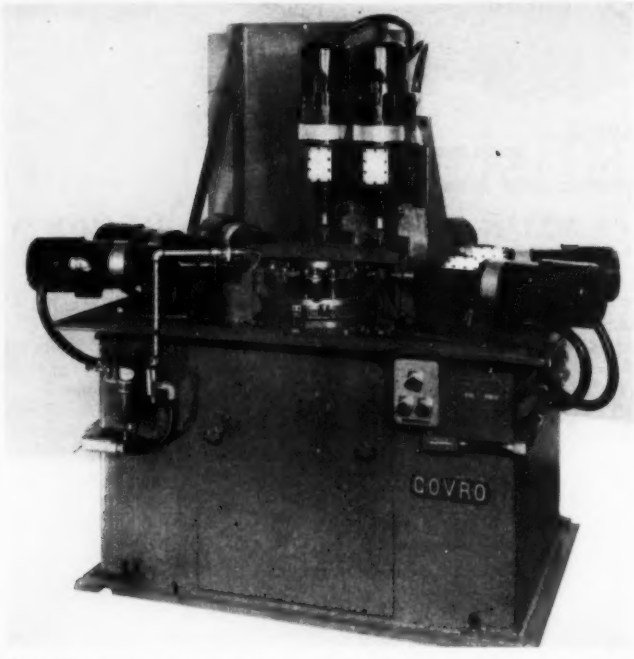


## Plexiglas Plating Cylinder For Either Cyanide or Acid

Plexiglas is suitable for either cyanide or acid solution, and can be carried through the entire cleaning, pickling, and plating cycle. Where cyanide is to be used, the cylinders are equipped with 90-tooth cast-iron gears with the two hangers of the same material. Where an acid solution such as nickel is employed, or the cylinder is carried through the entire cycle, 90-tooth Merlon or Plexiglas gears are supplied. The hangers are then rubber-covered cast iron.

The illustration shows a 14x30-in.-OD cylinder with rubber-covered arms and flexible dangler contacts. The Plexiglas used can withstand temperatures up to 185 F.

*The Hanson-Van-Winkle-Munning Co., Matawan, N. J.*




DRILLING, reaming, countersinking, and tapping of a small part is done automatically on this machine. Production of a brass part requiring eight operations was done at a rate of 1200 pieces per hour. The setup employs 7 Govro-Nelson automatic drilling units and 1 automatic tapping unit which are electrically interlocked to operate in conjunction with a Geneva-type indexing dial. The part is automatically clamped, unclamped, and ejected, the chips being automatically blown off the fixture.—*Govro-Nelson Co., 1933 Antoinette, Detroit 8, Mich.*

## Hard-Facing Rod for Medium Impact, High Abrasion

The Wear-Flame "40" is an oxyacetylene welding rod that is centrifugally cast. It consists of wear-resistant chromium carbides contained in a hard iron-chromium-manganese-alloy matrix.

Properties: Hardness of the beads is said to be retained at relatively high temperatures. It cannot be forged at any temperature, and it will not respond to heat treatment. Deposits are said to resist galling and seizing and retain a high-polished surface.

Hardness of the deposited metal is 56-58 R$_c$. Area covered per lb at ⅛-in. depth: 25-28 sq. in. Sizes range from ⅛ to ⅜ in. dia in 14-in. lengths.

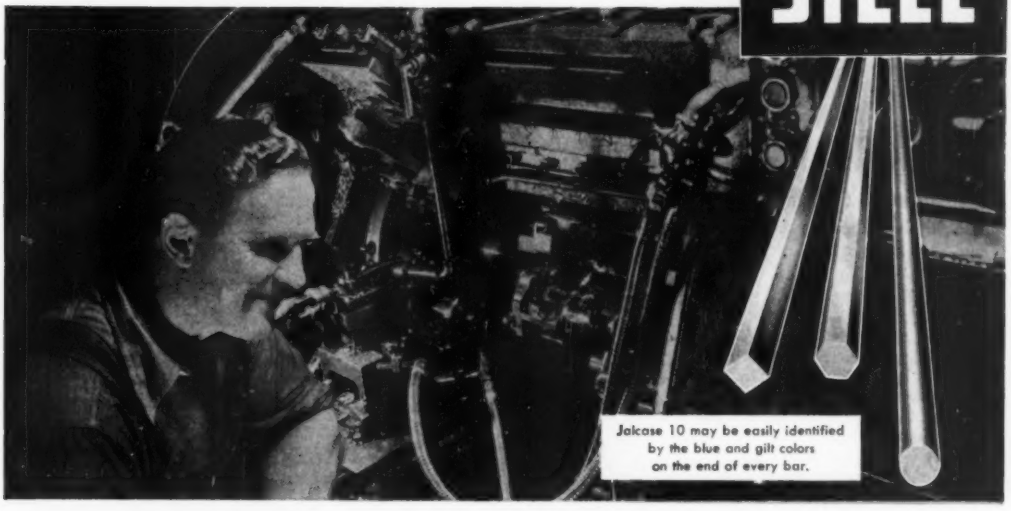
*Alloy Rods Co., 5505 W. Market St., York, Pa.*

# JALCASE 10 HELPS YOU

**. . . eliminate a production step**

**. . . machine better cold-finished parts**

**J&L STEEL**




*Check these advantages of* **JALCASE 10** *that offer you faster, more economical operations . . .*

## NO HEAT-TREATING OF FINISHED PARTS REQUIRED

Many times finished part specifications on a job call for a high degree of hardness, but not as high as that obtained through heat-treating the finished part. In these applications, parts manufacturers and machinists have found it profitable to use Jalcase 10 and eliminate heat-treating altogether.

## MINIMUM DISTORTION

Although Jalcase 10 is a high-carbon steel, distortion is cut to a minimum through special treatment during the cold-finishing process. As a result, when mechanical properties must be as high as possible and distortion held to a minimum, Jalcase 10 fulfills these rigid requirements.

## HIGH MECHANICAL PROPERTIES

Jalcase 10 (A.I.S.I. No. C-1144) has the following cold-finished properties:

| | |
|---|---|
| **Minimum Tensile Strength** | **115,000 lb/sq. in.** |
| **Minimum Yield Strength** | **100,000 lb/sq. in.** |
| **Elongation in 2 inches** | **7% (minimum)** |
| **Reduction of area** | **20 %(minimum)** |
| **Brinell Hardness Range** | **235—285** |

***PLUS*** . . . all the other advantages Jalcase steels have over ordinary screw stock:

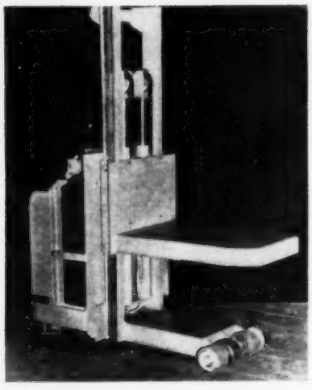
1. **lower cost per unit produced**
2. **finer finish on completed pieces**
3. **longer machine-tool life**
4. **less screw-machine down-time**

## *WANT MORE INFORMATION?*

Send for our FREE booklet entitled "You Can Make Them Better with Cold-finished Jalcase." This illustrated booklet gives you complete technical information about *all ten* grades of Jalcase and how they can help you get better results in your machining operations. WRITE TODAY!

**JONES & LAUGHLIN STEEL CORPORATION**

**402 JONES & LAUGHLIN BUILDING, PITTSBURGH, PENNSYLVANIA**



## Lyon-Raymond Stacking Truck Has 4000-lb Capacity

This truck is able to right-angle stack in aisles only 24-in. (width of platform) wider than the load length.

It has a lowered height of either 7 or 11 in. With the standard 83-in. mast, it can elevate 58 in. Four wheels with heavy-duty rubber tires support the load. The tractor has a 10-in. drive wheel and two 7-in. stabilizing wheels mounted on a spring-suspended swivel caster.

*Lyon-Raymond Corp., 47-79 Madison St., Greene, N. Y.*

**16-FT LIFT is attained by these gasoline or electric trucks through an extra set of front channels and on additional hydraulic cylinder. The channels are hung directly in front of the regular telescopic ones and are operated by separate control. The attachment can be quickly removed for normal operation.**—*Philadelphia Div., Yale & Towne Mfg. Co., 11000 Roosevelt Blvd., Philadelphia 15, Pa.*

## All Springs Eliminated In Ross Air Safety Valve

Greater safety for operators is supplied by this air-control solenoid valve. It will move to a safe position even if the air or electrical supply fails.

One of the features of the valve is the elimination of all springs. This, together with the use of a clapper-type solenoid, is said to greatly add to its safety.

The major pistons and poppets are tied together in one unit—giving simultaneous movement. The use of an over-size exhaust means fast control. The pilot operating valve floats on needle bearings. Groups of valve parts are removable as assemblies, simplifying maintenance.

Operating line pressures range from 40 to 125 psi. The valve can be in-line or bracket mounted. It is available in ¼- to 1¼-in. pipe sizes, straightway or 3-way, normally closed or normally open. Current consumption ranges from 0.56 holding to 4.3 amps inrush at 115/60 v.

*Ross Operating Valve Co., 120 E. Golden Gate, Detroit 3, Mich.*

## Permanent Fastening Device Anchors by Thumb Pressure

This fastener can replace screws and bolts in certain applications. It is easy to both assemble and disassemble; saving production time and maintenance time for the user.

The fastener operates by expanding a spring clip through depressing the top plate. The legs of the clip are bulged at the center to hook onto the back of the plate.

Known as Thumbweld, the fastener is made for 3/16-in. holes and for sheet-metal thicknesses up to ¼ in. This will be increased to hole sizes from ⅛ to ½ in. and thicknesses up to ½ in.

In the 3/16 in. size, it can be loaded up to 15 lb per fastener. Where there is heavy vibration, this should not exceed 5 lb.

*American Shower Door Co., 1028 La Brea Ave., Los Angeles, Calif.*

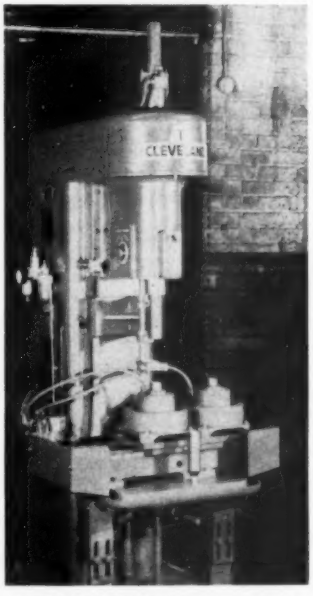
## Cast-Iron Gas-Welding Rod Subs for Nickel-Base Alloys

Identified as the All-State No. 3 cast-iron (copper-coated) welding and brazing rod, it is recommended for both salvage and production. It can be used for repairing breaks and cracks, filling blow holes, and building up worn surfaces.

It is said to flow out better, make a denser deposit, and to be more easily machined than other cast-iron rods. The copper coating is claimed to prevent rusting and improve flowing. Tensile strength is up to 48,000 psi. Brinnel hardness: 170-200. Working temperature is 1400-1500 F.

The rod is applied with a cast-iron flux and a neutral flame. Preheat large castings to 800 F.

*All-State Welding Alloys Co., Inc., 273 Ferris Ave., White Plains, N. Y.*



**AUTOMATIC TAPPER turns out 3.5 in. pocket bodies at rate of 100 pieces per hour. Shuttle fixture and chucks are air operated. Cutting speed of 34 fpm is used on the 1 25/32 in., 16-pitch thread. Material is 4140 seamless steel tubing, hardened to 35-37 Rockwell C.**—*The Cleveland Tapping Machine Co., Canton, Ohio.*

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Grades
Alloys
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Here is a handy compilation of the latest information on Magnesium Alloys and Products. The purpose of this book is to acquaint the reader with the forms in which magnesium is manufactured and to provide information on properties, sizes, tolerances and other significant data.

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# EUROPE STUDIES MACHINABILITY AND HIGH SPEEDS TOO...

**TO EXPLAIN . . . Last summer, Ivon C. Toby was one of a group of American engineers making a special survey of European metal-working plants. While some of Mr. Toby's findings are understandably confidential, here are a number of observations on the general subject of high-speed machining research in Europe, with Mr. Toby's sketches drawn from memory.**

**Mr. Toby was born in Glasgow, Scotland, just after World War I, and was graduated from the South Devon Technical College with the equivalent of our BSME in 1939. He worked in an engineering office in England, then for Bristol Aeroplane Co., before he came to Canada with National Steel Car Corp. After experience in several Canadian plants, he became a tool designer, then chief of engineering for Canadian Acme Screw & Gear, Ltd. In 1948, he came to New Britain Machine Company as chief engineer of process engineering in the Screw Products Division. He resigned there to undertake this European trip, has since been a tool engineer for Hartford Machine Screw Co., and an instructor at Conn. State Tech. Institute.—Editor.**

BY IVON C. TOBY • Tool Engineer
HARTFORD MACHINE SCREW CO. WINDSOR, CONN.

IT is a great mistake to assume that the United States has most of the "know-how" in the screw-machine and allied production fields; we can always learn something from the other fellow. In many ways, we cannot compare the setup over there with our own; we can only contrast the differences. Geography and circumstances have played their part in giving them a different approach to a somewhat similar problem.

British people do not "ballyhoo" their products in the manner we do. In the U. S., the general tendency is to be so enthusiastic about the machine or product being sold that good points are emphasized and the customer tends to find out about the undesirable aspects himself.

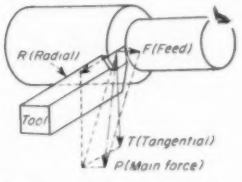
In Britain, we had to approach our survey with a different set of values, for not only in the research laboratories, but in the sales end of the businesses, a sense of caution prevails. Quite often the good and bad sides of a piece of merchandise are explained. At first, this approach gives you the impression that the particular piece of equipment is being depreciated and makes you wonder whether, if the manufacturer is confident of his machine, there is something wrong with it. Of course, there is some degree of truth in this observation, for most Europeans are aware of the terrific advances made under the U. S. system, but we found that by constantly digging behind the facade of people and plants, getting to know the people and their problems, that many keen minds are at work with very interesting ideas.

An analogy to the above, is a comparison of say a good British moving picture like "Quartet" or the "Red Shoes", with a similar good U. S. job. You will find that a more mature approach is given to the audience; the players are cast with both good and bad sides to their characters and the audience has to go through a few mental gymnastics to make up its own mind on some of the actions presented.

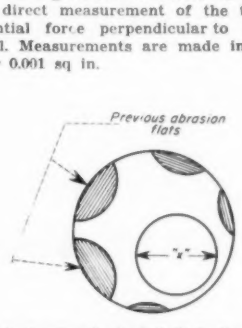
### *Machinability Tester*

Much work is being done in England, as in this country, in developing a good, practical, machinability tester, one that is constant through most of the steel ranges, that is accurate enough for rating the machinability of bar stock, in the producing plant and in the research laboratory. The problems are very complex.

Based on the work of the late Dr. Schlesinger (*AM*, Nov. 21, 1946) one group in England is promoting an instrument employing a cutting-resistance test (Fig. 1), giving a cutting-resistance factor. Next an abrasion test is made on the same bar of steel, giving an abrasion factor by measuring the abrading effect on a hardened steel ball (Fig. 2). A combination of these two tests, giving a machinability index figure, purports to show the machining effort. This particular group is still experimenting to create a regular pattern on the machinability figure,

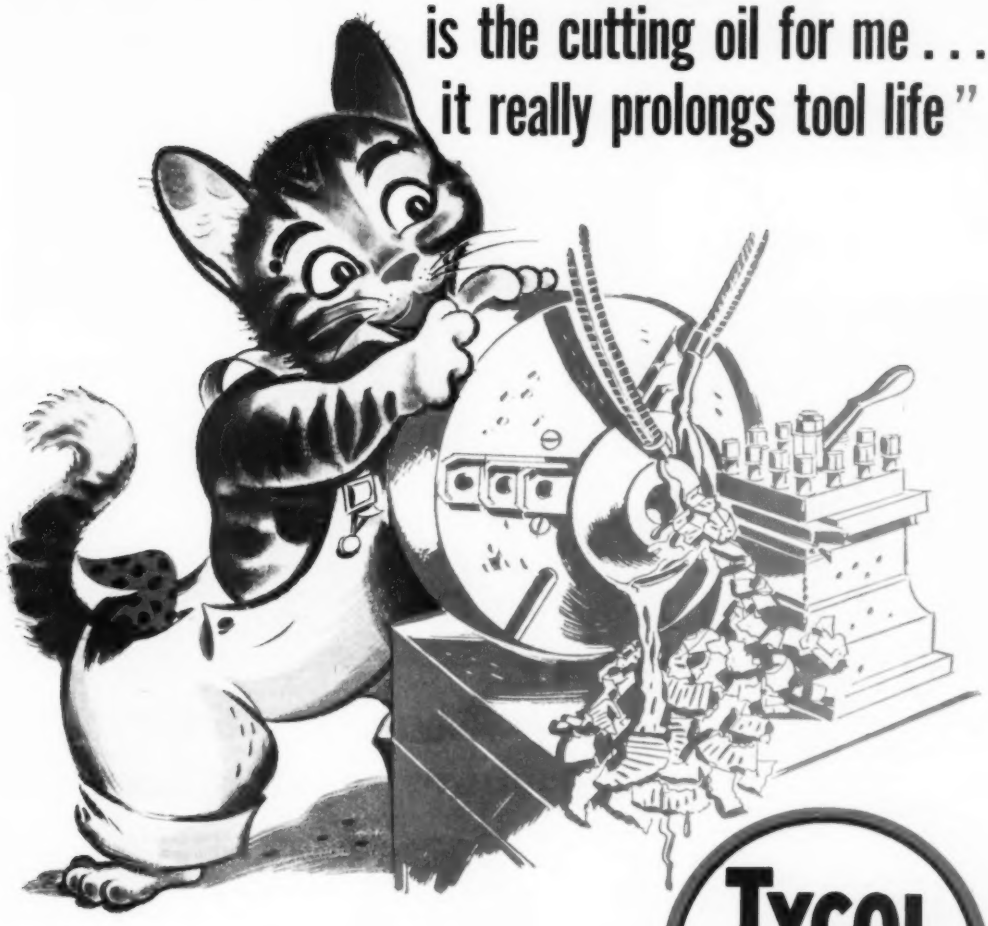



**1** Cutting-resistance factor is the direct measurement of the tangential force perpendicular to the tool. Measurements are made in lb per 0.001 sq in.




**2** A hardened steel ball is forced into the work under pressure. Abraded elliptical surface at axis *X* is measured to give abrasion factor

# "Tycol Amulkut is the cutting oil for me . . . it really prolongs tool life"



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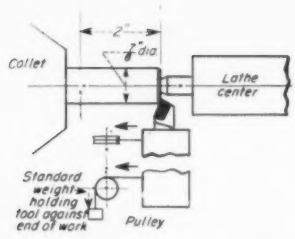


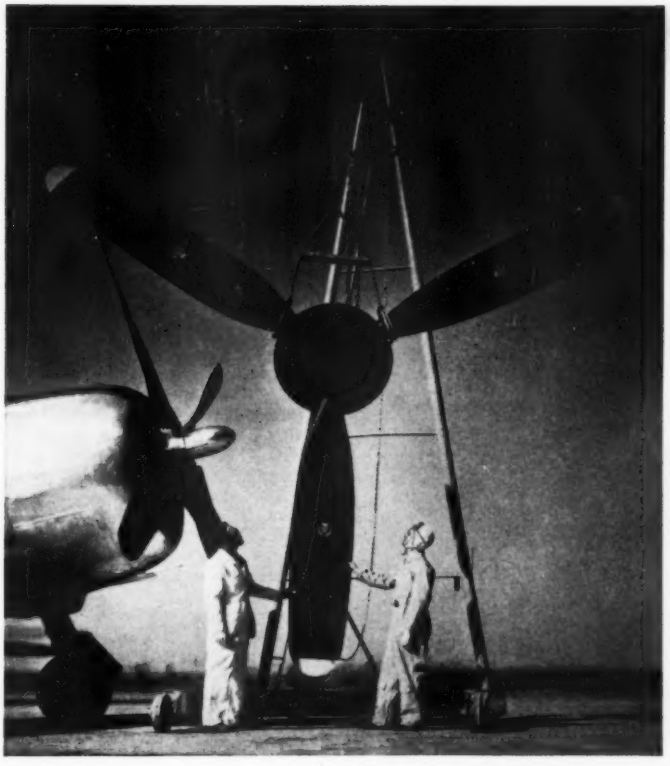

**3** This test is often performed in U.S. steel mills on cold-drawn steel, on the theory that a machinability index is determined by metal removal. A standard tool is fed along a bar by a standard weight. Six cuts are made on ⅞-in.-dia x 2-in. long bar. Results are compared with known standards to arrive at a rating or index number

throughout all types of steels and conditions (Fig. 3).

In my opinion, by far the best approach to this problem is being made by groups in Coventry. These groups claim that until you reach the optimum surface cutting speed for a certain steel, you cannot begin to ascertain a machinability factor. This factor is based on material to be removed per machine horsepower. Having once reached this point, you can devise standard carbide cutting tools, rake angles, etc. These laboratories are equipped with very large and rigid lathes, milling machines, etc., especially built for extra rigidity and high-speed operation, with flywheels, etc. By eliminating vibration and providing correct tool angles, some amazing results have been produced and could be duplicated in most machine shops. Tests are run with carbide tooling, without any coolant and always making sure that the material after being machined stays a little above room temperature, the tool at room temperature and the heavy chips cool enough to pick up very shortly after cutting.

Their research is directed towards eliminating contradictions in tool life from two different kinds of wear, namely the rubbing action of the work on the cutting edge and the oscillations of the cutting force. High-sulfur steel, machined at high speed, had been under test, but they assured us that the tool life was lower, no doubt because of the destructive action of the sulfur on the carbide. They appeared to be taking a chip 3/32 in. thick by ¾ in. deep at about 350 sfpm.

In these same shops, we saw much research on development of single-point carbide tools and machinability



THE CONVAIR B-36 *and the RB-36 (shown above) have six Curtiss propellers, like the one at the left, which is the world's largest production model.*

THE MACHINE. *This drill press, equipped with air operated ram and timer, provides the power and automatic operation for brushing the hub bearing. This machine and accessories were on hand, making it possible to get into production in a hurry.*

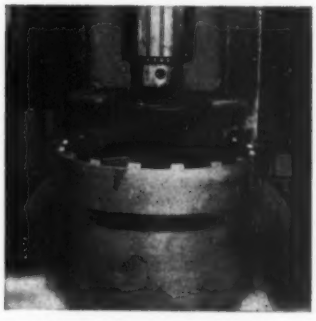
# What's this 3-bladed approach to speed defense production?

## ...a brush! It saves time . . . cost . . . space.

The Propeller Division of the Curtiss-Wright Corporation had a problem. It had to clean and finish a shot-peened bearing area inside the hubs of its propellers. It appeared this vital operation would require large, elaborate equipment, costly jigs and considerable time getting into production.

Then, with the help of their **O**sborn **B**rushing **A**nalyst, a method was worked out to do it with power brushing. By mounting an Osborn Monitor® Brush on a simple drill press adapted for the job, they are getting excellent finishes at high speed.

This is another example how Osborn power brushing can help simplify and speed production jobs. Your **O**sborn **B**rushing **A**nalyst will gladly assist on any defense tooling-up problems involving product cleaning or finishing. *Write Dept. 464, The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



THE BRUSH. *This Osborn Monitor Brush, rotating at 900 r.p.m., feeds into the hub, removes loose particles and smoothes the surface of the shot-peened bearing area (and cleans the threads shown at the top of the hub). Various diameters of brushes are used to suit the hub sizes.*

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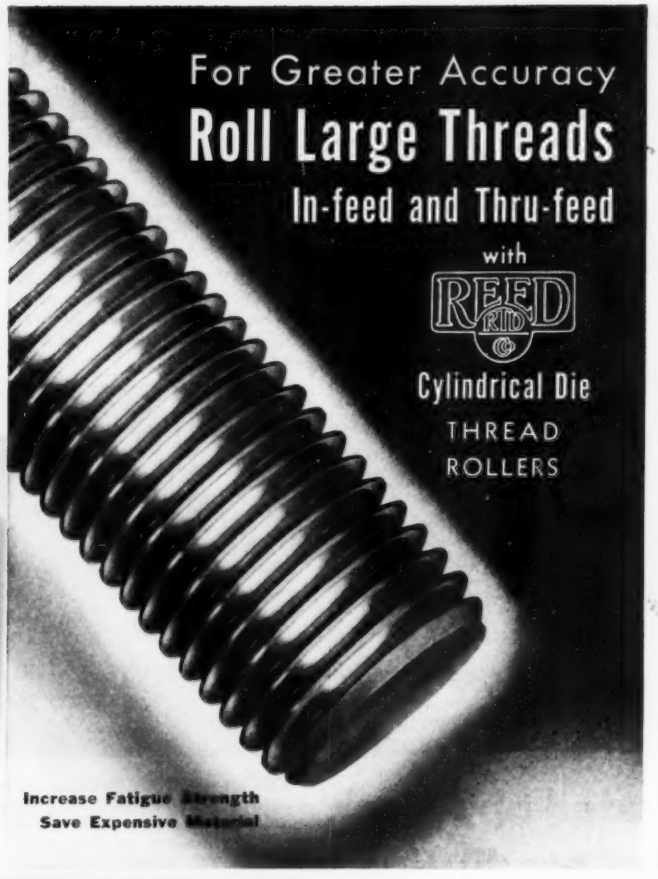

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AM-015


ratings for special steel forgings (Government-sponsored; details restricted). Even with these specially constructed machine tools, they claim not to have reached the highest surface speed and feed combination for these materials with good tool life.

All this ties in with my understanding of thoughts on this side of the water, that until we develop and build more-rigid and faster-operating machine tools we cannot cope with the advances in machining these faster-machining steels. Given the machines, we can develop carbide tools accordingly and find our optimum machinability. Then, and only then, can a machinability factor be established, that will be standard throughout a curve, drawn from plots made from similar factors, obtained by similar tests on the whole range of steels and other materials.

The English engineers explain that the whole mathematics of machinability becomes involved with figures proved in practice, until those figures are tied down by those fixed elements. We found that this approach was producing the most promising results.

### *Job-Shop Production*

The English are up against one problem that we sometimes meet in the Northeastern states, where a job shop will be turning out a much larger variety of work, than a similar job shop say in the Mid-West, although the total volume of products will be roughly the same. This is very noticeable in British steel mills, where an infinite variety of items makes production so diversified, and with no great production of any one item (by U. S. standards). Of course, geography bears on this problem, as in the analogy above to our own New England States.

During the late war, it was necessary very often over there to improvise and use extra ingenuity to keep plants operating after an air raid. An interesting example of this, was noticed in a large machine-tool plant in Coventry, where in a particularly bad raid a whole line of vital machines were blown apart. The management pieced together the bases of the shattered equipment, then poured concrete around the bases and sides after propping each machine in a shallow hole. We saw these machines operating today and every day, with hanging signs overhead as a working memorial to what can be done in a pinch.

Later on in Scotland, we began to be more aware of the fact that metalworkers there do not push the

# BOOST Your "Batting Average" IN PRODUCTION AND PRECISION

With Kent-Owens Milling Machines in your production line-up . . . you'll turn out *more work* . . . with *greater accuracy* . . . and *lower costs!*

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In the Kent-Owens Standard line are a wide range of hydraulic and hand operated machines. Let a Kent-Owens engineer recommend machines and tooling best suited to your requirements. Write for details. Kent-Owens Machine Co., Toledo, Ohio.

**No. 2-20 Milling Machine**
**Table, 42" x 12"**
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Today's production may bring you new problems, including:

- *An entirely different type of work requiring appropriate carbide tooling techniques.*
- *Converting some or all of your facilities to carbide tooling.*
- *Training new personnel in the use and maintenance of carbide tooling.*
- *Or, you may have been using carbide tooling for years, but are now faced with short tool supplies, increasing production schedules, and limited skilled personnel.*

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Every day Kennametal field engineers encounter, and help solve, scores of carbide machining jobs. They know their Kennametal from the ground floor up — know the performance of various compositions and tool designs for cutting different metals, on practically every type of operation.

Your Kennametal representative is ready to bring you this collective experience — the greatest accumulation of "know-how" that is available through any one source. Ask him for suggestions that will ease the strain on materials, machines, and men in your shop. Call our nearest field office — see list below.

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SPRINGFIELD —1537 Main Street
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SYRACUSE —494 Wendell Terrace
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equipment in the same manner as we do over here. We go to a lot of trouble to get the last ounce of production out of a given setup, using a combination of spindle speeds, feeds, tool life, surface finish, etc. Generally speaking, over there, as long as the tools stand up, they try and emphasize a good steady production rate, based on pieces in the pan at the end of the day. On similar parts, being manufactured on similar machines, of the same material, little or no attempt has been made to bring surface speeds, etc., up to what we would consider good on this side. From one viewpoint this is not too bad, for who among us, has not seen a production setup pepped up, tools burning up, etc., and on top of this a low production at the end of the day?

### *New Grinding Wheel*

While traveling through the grinding rooms of production plants in Scotland, we noticed a new type of grinding wheel setup in Churchill and Cincinnati centerless through-feed grinders. This is a graduated variable-grit-and-grade abrasive wheel, for combination rough- and finish-grinding operations in one wheel, with a view to speeding up production and eliminating several operations.

It is built up of a graduated grit and grading, being manufactured from very strong plastic materials. This new wheel is graduated across the face, the leading edge, which has the major stock removal to complete, being the coarsest and hardest. It is gradually finer towards the finishing edge. The grading, of course, is simultaneously adjusted throughout the width of the wheel to compensate for the various amounts of work entailed as the rod passes through. Therefore, the leading edge of the wheel does the rough grind, and the finishing edge performs the sizing and polishing operations. The graduated grit accommodates itself to the amount of material to be removed, and the graduated grading to the varying amount of punishment across its grinding face.

These wheels are cool cutting and lend themselves to a phenomenal rate of cut. Best results are obtained at speeds between 5500 and 6500 sfpm. The fact that many high-grade production shops are using these wheels testifies to their increasing quality and production.

### *Strangled by Capstan*

After a while, one is forced to the belief that the British Isles are being slowly strangled by the turret

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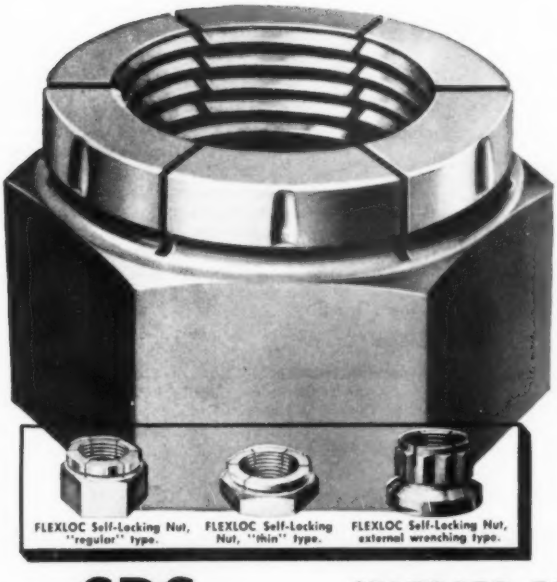
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FLEXLOC Self-Locking Nut, external wrenching type.

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So if you have an application where plain nuts might or actually do loosen and back off, try ***FLEXLOC, the one-piece, all-metal STOP-and LOCK-NUT "that won't work loose."***

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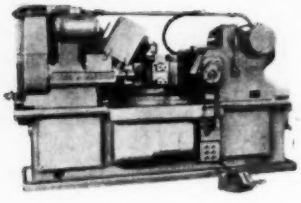

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When any of the various functions for which this machine is designed are performed on it, no further machining is requred. The job is finished.

The basic "1-2-3" method—exclusive with Goss & De Leeuw—provides for gripping work in the chuck and machining all ends either simultaneously or in sequence. By eliminating several handlings and set-ups, the "1-2-3" method produces finished pieces at a fraction of the time and cost ordinarily required.

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MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

and capstan lathe. Multi-spindle automatics are not so commonplace as in America, and although there are many efficient setups on hand screw machines, they in reality act like a millstone around the neck of the economy. In a country that must use all its manpower efficiently and produce more in order to survive at all, it would seem to be an absolute necessity to get more of these machines in the production line.

Rarely in Scotland, did we see in the industrial plants, as we saw in England, that quaint habit of stopping for tea in the morning and afternoon. The Scots seem to think that the man-hours lost are much too important. Stopping for tea is quite a ritual and has to be seen to be appreciated. Practiced by all members of the social scale, it is, to say the least certainly an awful loss of manhours.

### *Iris Die*

In Sheffield, England, where the cold-drawing mills are similar in operation to our own, several plants use a continuously adjustable carbide die for cold-drawing hexagon stock. These dies are built in a manner similar to the "iris" aperture "F" opening in a camera, and can be adjusted to different sizes of stock in a few minutes (Fig. 4). Again, these plants have to be able to change their setups quickly, because of this very diversified production.

A primary steel mill close by had been on our itinerary, but we found it closed down for the annaul two-week shutdown. A trip through during this period shows a large percentage of the equipment torn apart for the overhaul. You can get into a very lively discussion with plant managers on this side, if you bring up the subject of the merits of such shutdowns.

Later on, on the Continent we met different points of view, with equip-

**4** This continuously adjustable cold-drawing die has six carbide segments dovetailed together and mounted in a master frame. Solid lines show the die set for a small hexagon, dotted lines for a larger one

# quick test screens out noisy transmission gears **before assembly**

A quick test on this new Red Ring Gear Sound Tester, equipped for air clamping, tells you immediately whether or not you have any noisy gears which will need additional processing before they are assembled into automatic transmissions.

The gear being tested is slipped onto the upper arbor and its pinion onto the arbor below, with a C-washer following each. Touching the air control lever locks both in place for the sound test which is run forward and reverse at various speeds and loading. Both gear and pinion are demounted just as easily after the test.

The gears are clamped by a predetermined spring pressure for positive safety under test. The compressed air is used to release the spring pressure for quick loading and unloading.

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The Torrington Rotary Swaging Machine delivers 4000 hammer blows a minute...reduces, sizes, rounds, points and tapers rod, wire and tubing... work-hardens metal for toughness and resilience... produces a burnished surface... utilizes every bit of stock.

Torrington Swager performance is based on our 42 years of swaging experience. Send the coupon for your free copy of the booklet illustrating the machines and describing the art of rotary swaging.

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ment being produced that competes very closely with our own.

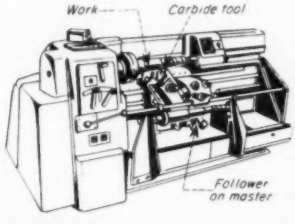
In the Ruhr basin, a carbide-tool plant has been rebuilt, after being demolished by air raids. The owners, having little money, had delegated the skilled workers into teams, to search in the rubble and pull out the machines. They got together and rebuilt that factory between them. These people are notoriously tenacious, but their energies are towards rebuilding.

It was not until we arrived in Switzerland, that we could evaluate our findings again. Some days were spent in Schaffhausen; a town so close to the German border that the Allies had bombed it by mistake during World War II.

### *Z Means X*

We noticed in many plants, that precision machine-tools were stencilled with the letter "Z" in pink paint. This letter was always placed close to the vulnerable mechanism of the machine. We learned that each worker has been trained, to smash the machine at the point "Z" when a signal is made throughout the plant signifying that the country has been invaded. The Swiss make it very apparent that they are ready for any eventuality. These particular factories, being so close to the border, would not have time to destroy the equipment more completely before the invaders would be upon them.

The well-known contour-turning machine is made in large quantities in Schaffhausen. It is a very rugged, high-speed, carbide-tooled machine. An approach similar to that of the people in Coventry, England, has been attempted. That is to say, great emphasis has been placed upon designing a vibrationless superior machine tool, that can be used right out in the plant and not under laboratory conditions. The machine is particularly large, with the single-




**5** Contour-turning machine seen at Schaffhausen, Switzerland. A follower on the carriage transmits directly to the tool on the same carriage variations in the master mounted below

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L&I Reamers ⅛" thru 1½" by 64ths are standard and are carried in stock. Sizes thru ⅝" are ground from the solid after hardening for dimensional stability. Grinding of both faces provides finer cutting edges, permits faster feeding and keeps resharpenings to a minimum. Flutes are ground for easy chip removal.

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Letter, Wire Gage and Fractional Size Reamers are available in sturdy folding metal cases. Write for catalog or see your L&I Distributor.

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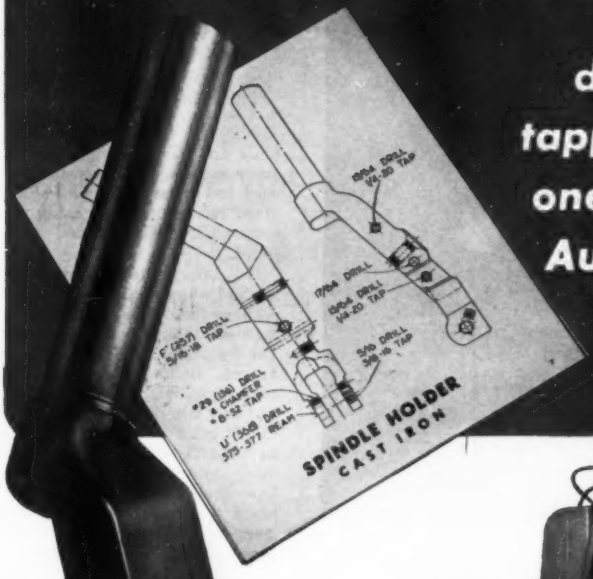

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**You can all help us by directing it back.**
**Select and collect all the scrap that you can**
**And sell it or give it to your local scrap man.**
**Vital production can then best be enrolled,**
**To bring quicker relief in these times of control.**

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Give us a chance to offer a "cast steel" answer for your parts problem. Our suggestions while your product is in the design stage will pay continuous dividends. Write or call today. Unitcast Corporation, Steel Casting Division, Toledo 9, Ohio. *In Canada:* Canadian-Unitcast Steel, Ltd., Sherbrooke, Quebec.

**UNITCASTINGS ARE FOUNDRY ENGINEERED**


point tool path follower, actuated from the master form (Fig. 5). A coin can be balanced on this machine during the most heavy cut. Every conceivable shape of part made of ordinary materials, as well as in aircraft steel alloys, were being test-run on our visit. This machine can be used for cutting large- and small-diameter work of varying lengths and materials. One jet-engine part that we saw demonstrated was several feet long, containing many contours and narrowing down to ¾-in. dia at some spots. A steadyrest was used, but there was a noticeable lack of vibration and no flexing of the part while being turned at high speed.

It is interesting to note that Switzerland is one of the few countries—perhaps the only country—that uses machine tools from every country. The Swiss had U.S., British, German, French, Italian, and other tools—even from behind the Iron Curtain. The only stipulation, apparently, was that it must be the best machine in its field. We had become used to being told in the other countries how they could accomplish a job much better, "if only the Government would allow us to import this such-and-such machine tool."

Later on, in Zurich, we learned that Germany may be doing more in this field than is obvious. Some of our Swiss friends had branch plants in Germany as a source of this information. It seems that, under the regulations and rules of the occupying powers, the Germans are not protected for any patent idea or development. Therefore, there is little incentive along those lines. However, it is generally thought that work is going on, and when some degree of protection is afforded, a burst of new ideas will be uncovered.

*"Migosh! quicksand!"*

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**FOR REPETITIVE MANUFACTURE OF PARTS FROM COILED STOCK**

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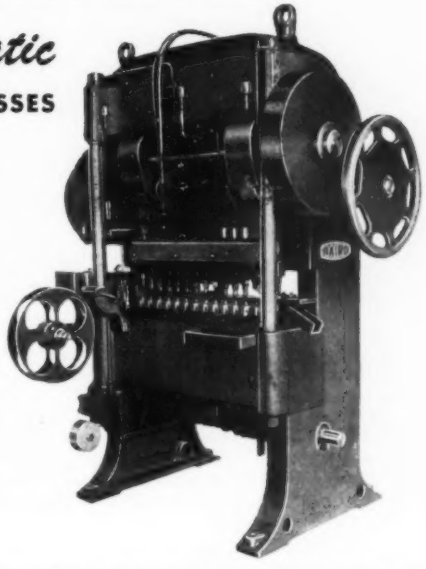
## BAIRD *Automatic*

### MULTIPLE TRANSFER PRESSES



Simply stated, this press combines, in a single cycle, operations that might otherwise require several smaller machines with an operator for each one.

There are so many varied tooling possibilities that it is impossible to enumerate them here. In ordinary operations the press automatically feeds coil stock for piercing, lettering, embossing, etc., then cuts the blank, places it in transfer fingers, moves it along to several other tool stations and ejects the finished piece. In addition, preformed material may be fed from the opposite end of press for many other operations . . . all completely automatic. A full set of tools (composed of punch and die blocks, their punches and dies, transfer slide and fingers) may be removed as a single unit . . . and a different set inserted, and in some instances without disturbing any adjustment . . . in a comparatively short time. Note the following example:

**. . . a typical BAIRD tooling set-up**

This is a complete die set with full complement of punches and dies in working position for the production of a special aircraft lock-nu . . . finished in one operation (14 stations). The transfer is in the loading position. After completion of stroke, work is pushed to transfer fingers by plungers operated by cams in back of and under the press. Production: 70 pieces per minute.

Full details of Transfer Press available in new bulletin . . . copy on request. Ask Baird about it!

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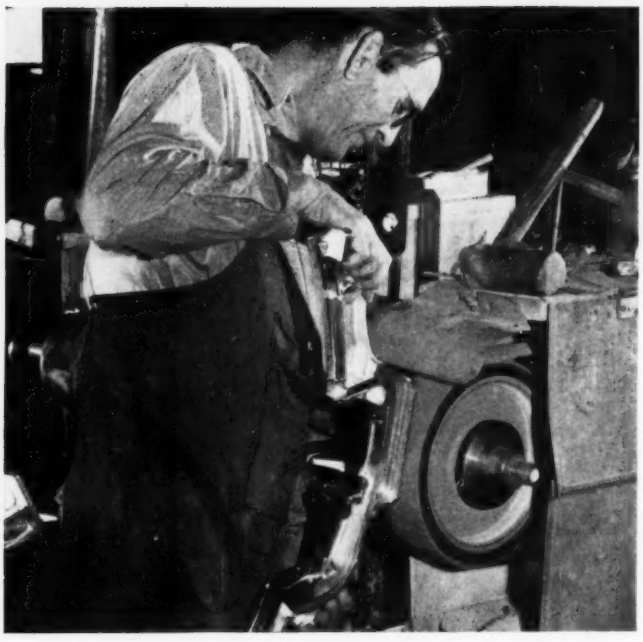

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Linmold Company, Compton, California, reports the 3M Backstand Method has eliminated one entire grinding operation. Flash and gates on aluminum castings are now cut close with a metal saw—then ground smooth in a single step. Snagging wheels and set-up wheels are no longer needed. Grinding time is cut in half!

The 3M Backstand Method and 3M Abrasive Belts can cut finishing costs in your plant, too. And standard grinding and polishing equipment is easily and quickly converted to the new system.

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Dept. AM-551, St. Paul 6, Minn.
Please send me copy of "Step Up Production" booklet.
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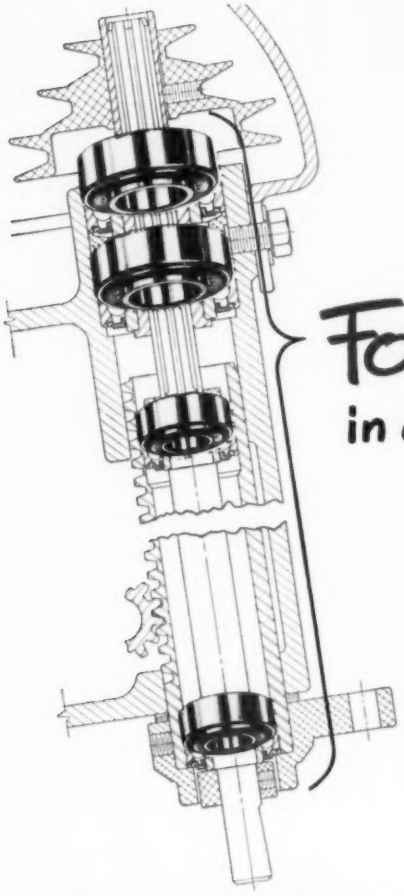
## ROUND TABLE Discussion

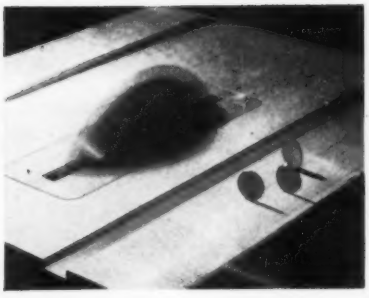
### LITTLE PLANT SCHOOLHOUSE

IN BRITAIN today, swept along by the impetus of the dollar drive, we are all becoming familiar with home work, and going back to school after middle life, even later, has met with a mixed reception. In the main, however, seniors and juniors would seem to be agreed on the possibilities attaching to the idea of courses for foremen but just as racing men believe in "courses for horses" so the seniors declare that only special courses would benefit many of their age.

On the principle that you cannot teach an old dog new tricks—which is not, of course, true of every old dog—they are convinced that too many new fangled ideas would defeat the purpose in view and that their last state might well be worse than their first. They feel that a series of lectures would achieve something in their case and that it is highly desirable those lectures be delivered by men of around their own age and breadth of experience. Few experiences can be more annoying to older men than to listen to a youngster attempting to teach them their job. In their case, the school master attitude should be conspicuously absent.

The writer attended a course which was, supposedly, designed for foremen of all ages. The instruction was not conveyed in the form of a lecture but was put over in the approved school master fashion. At the end of the two hour session, papers were handed round for home digestion, with a request for written work to be ready for the next meeting when oral work on the paper would also be part of the proceedings. A small number of the old timers made a modest show with the written work while the great majority did not attempt it at all or if they did they did not present it. The oral work, in class, was an embarrassing experience for the oldsters who seemed to find the utmost difficulty in answering the questions fired at them. The questions were not really difficult and the writer felt certain that most of the old timers knew the answers but were uncertain of their ability to frame them properly. This, in large measure, was due to the very formal and school master attitude of the instructor. All in all, the venture was a complete "wash out" so far as the old timers were





# FOUR star performers in a "ONE TOOL WORKSHOP"

Here's visual evidence of the Star Performers' worth to the SHOPSMITH . . . an amazingly accurate, versatile, low-priced electric power tool for hobbyists, maintenance departments, and small businesses. With saw blade at full speed, coins stand on edge . . . a tribute not only to the precision construction of the machine, but to the performance of Fafnir Ball Bearings.

Since the SHOPSMITH operates in both vertical and horizontal position and under so many different conditions, the Fafnir head-stock ball bearings are an extremely important factor to successful operation.

Putting accuracy into inexpensive equipment is a problem that Fafnir has solved successfully on many occasions. That's because Fafnir's experience is not limited to just one or two industries but is industry wide. The Fafnir Bearing Company, New Britain, Conn.

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MOST COMPLETE LINE IN AMERICA

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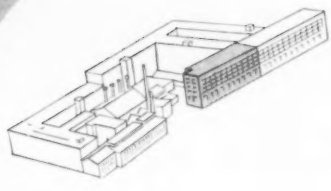
The Shopsmith spindle floats on four Fafnir pre-lubricated Mechani-Seal Type Ball Bearings. Two support the spindle in the quill, and two support the internally splined drive shaft.

* PROGRESS REPORT

## NEW PLANT ADDITION!



Part of a long range expansion program . . . the recently completed, 6-story modern building located at the main Fafnir Plant comes at an opportune time. It adds 70,000 square feet of manufacturing space to the 750,000 previously occupied by 3 Fafnir plants . . . now, almost 19 acres.

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**FEEDS THEM ALL**

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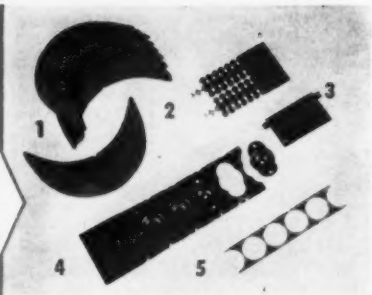


NO MORE TEDIOUS SET-UPS—just space stock guides, adjust jaw clearances and rotate micrometer dial to obtain exact stroke length; varies stroke in .001" increments. No wasted set-up time, no more slow costly hand feeding! Handles material from foil to two by fours! Costs only ⅓ usual price—IMMEDIATE DELIVERY! WRITE FOR DETAILS!

1) **Feeds 12 layers of cardboard per stroke.**
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3) **Feeds slippery, oily nickel-plated steel to .002" without pilots.**
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concerned and, as a consequence, their appearances in class diminished to almost vanishing point long before the end of the course.

In some plants in Britain, enrollment is optional, while in others it is treated as part of the job. The writer's own opinion, as the result of critical observation and discussion with senior ranks, is that compulsory enrollment for seniors is very much resented. They declare that many of their number would reap so little benefit from beginning school all over again that they should be left alone to decide for themselves. They feel that most of them can be more profitably and pleasurably employed in their shops where they never feel out of their depth. Undoubtedly, there is much to be said for this contention of the older foremen when one considers that many of them were only scantily educated and attained to their present rank largely because of their native gumption, inquiring minds, cool, sagacious heads and a natural aptitude for leading. If the matter of falling into line is left to their discretion, much good will come to the scheme since voluntary workers always display greater zeal and imagination than do conscripts. The foregoing should not be read to mean that the writer believes foremen don't need, say, a technical education or an insight into the commercial side, rather than should it be seen as a tentative suggestion for bridging a temporary gap in present day industrial organization and to make the change over to the new type of foreman as comfortably for the old timers as circumstances will permit and with the minimum of dislocation in the shops. The feeling

*"This wire from Washington says to tool up and start turning out a new scare weapon—it's called the Thing."*

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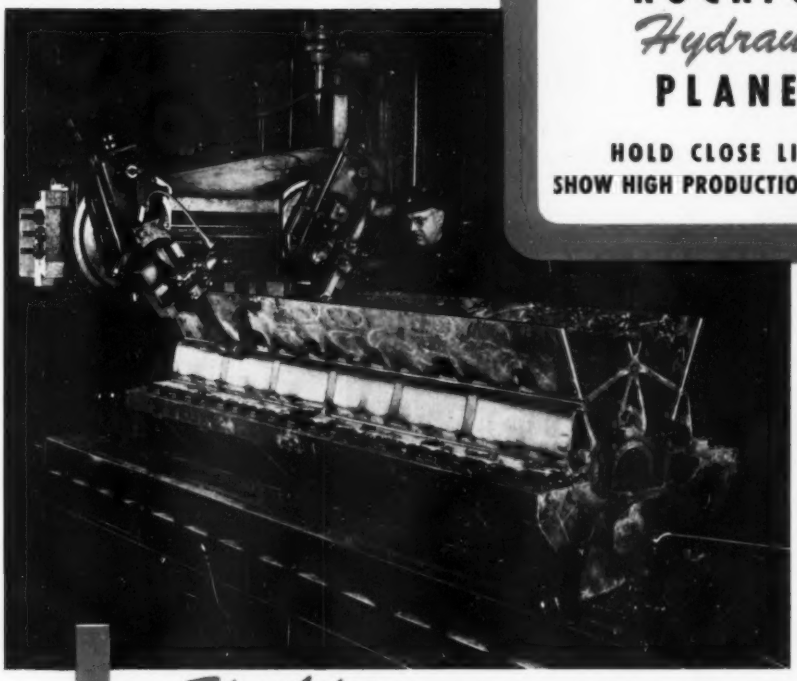
**HOLD CLOSE LIMITS . . .**
**SHOW HIGH PRODUCTION AT LOW COST**



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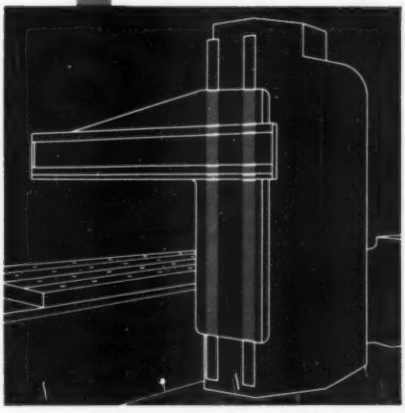
**CROSS RAIL HEADS ADJUST EASILY**

Two heads operate simultaneously for one-cut finishing of both sides of weldment on locomotive V-cylinder block at American Locomotive Co., Auburn, N. Y. Grooves are cut 3/8" x 1/2" ± .015". Operation is completed in 3-1/2 hours. Tool heads are quickly and easily positioned with micrometer dial precision screw shafts. Automatic hydro-electric clamps hold rail securely locked in position.



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over here would seem to be that for foremen of forty to forty-five, training schemes should be compulsory, over that age the matter should be optional.

Are the results worth the cost and the resentment? In the case of the old timers and in the absence of any reliable figures covering Britain as a whole, it is impossible, confidently, to answer this question as related to this country, from the writer's experience as a result of much interest and enquiry, the results are *not* worth the cost, the resentment is a very real opposition factor. A private canvas by the writer of all the senior foremen known to him in the Lanarkshire area did not draw one unqualified "Yes" to the question "Do you derive any help in running your job as a result of attending school courses"? An unqualified "No" was the answer to the question "Do you agree that those courses should be compulsory for the older, widely experienced foremen"?

C. D. Mackinnon
*Airdrie, Scotland*

•

## SQUEAL OR SQUIRM

THE ONE point I believe that stands out in Al's discussion with Ed is not what either of them said but rather what they didn't say. Ed never asked Al if he previously had found Riley was satisfactory as a workman or even if he himself knew Riley was stalling or whether Moore disliked Riley or have a grudge against him to make such a charge.

Is Moore justified in squealing to Al under the circumstances?

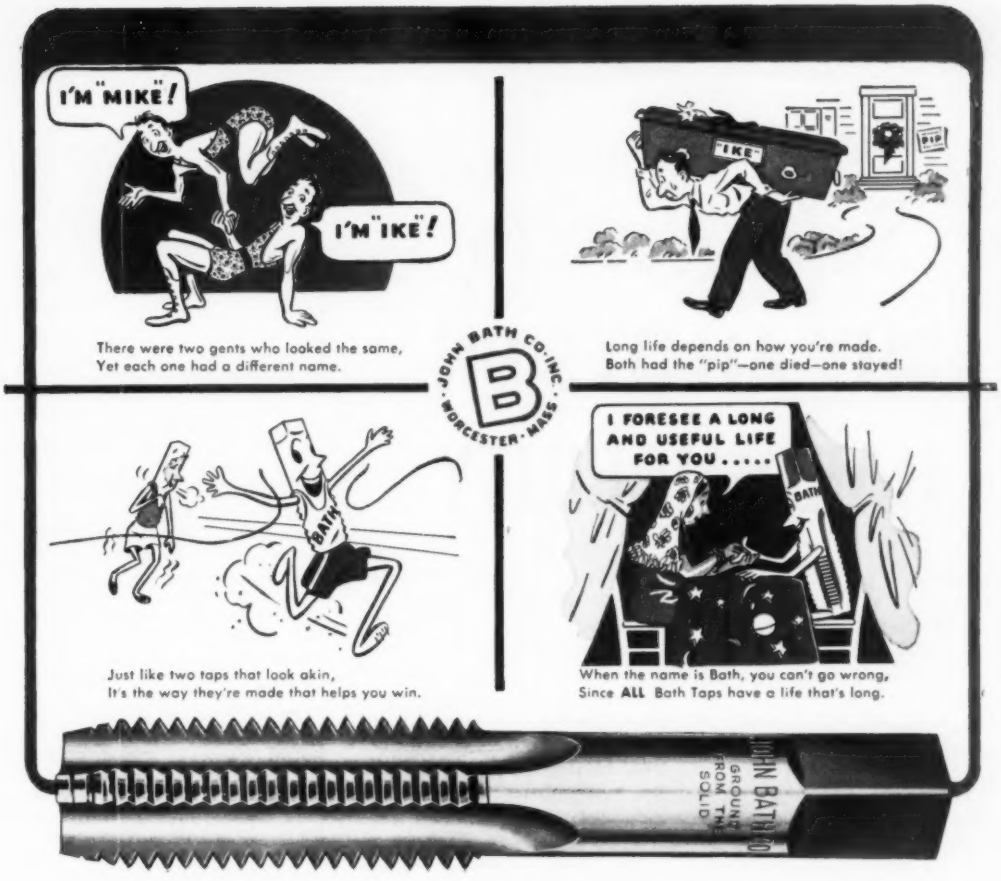
Is squealing justified at any time to the boss about a fellow employee? There are certain instances where it might be justified:

(1) If a gang were on piecework and all drew equal bonus, and one or two did not do a fair share of the work, stalling in fact.

(2) If several men are on, say, an assembly job, that entails some fairly heavy lifting and some fellow doesn't pull his own weight.

(3) If a job on which a number of workmen are employed upon happens to be particularly urgent and the foreman requests a little extra effort until the job is finished.

In circumstances such as those mentioned any chap not pulling his own weight deserves to be brought to the boss' attention for stalling provided he has not already become wise to the staller's lack of effort and reprimanded him. However, in similar cases workers generally cure


I'M "MIKE"!
I'M "IKE"!
There were two gents who looked the same,
Yet each one had a different name.
IKE
PIP
Long life depends on how you're made.
Both had the "pip"—one died—one stayed!
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BATH
Just like two taps that look akin,
It's the way they're made that helps you win.
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There are many reasons for the long life of Bath Taps, starting with the careful selection, heat treating and hardening of the basic steel.

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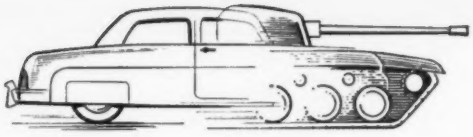

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The defense program requires conservation of strategic metals —so, as in the last war, alloy steel analyses are changing. Some standard alloys are still available. But many new, or interim, analyses are already on the market. Others are on the way.

Today more than ever, under these changing conditions, the safest way to buy alloys is on the basis of analysis *and* hardenability rather than on analysis alone. When we know the hardness or tensile strength you need, we make absolutely sure that the alloy you receive meets your requirements—even though it will be many months before standard hardenability ranges of the new steels are established. Here is how we do it:

We carefully test each and every heat of as-rolled and annealed alloy steel in our stocks. This gives us actual knowledge of the hardenability of every bar of Ryerson alloy. Thus when you specify on a hardenability basis you can be sure the alloy you get from Ryerson will meet your requirements. And you can also be sure of getting the desired heat treatment results because the test information and other helpful data to guide you come with the steel.

Not every company makes these tests, records this information, but Ryerson does—and at no extra cost to you. It's all part of a service system called the Ryerson Certified Steel Plan. So during this confusing period, order by AISI and SAE number if you wish but also specify hardenability and be doubly sure. Though some shortages are inevitable, we will do our level best to supply the alloy steel you need.

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that kind of thing by ganging up on the offender so he finds trying to evade his fair share of work is not worth while. So he either quits or toes the line from then on. All it was necessary to do, even if Al was unaware that Riley was stalling, was to find out, and then if he is, put a stop to it. If not, forget the whole business. With regard to what the other fellows in the shop will think, if they have become accustomed to getting a square deal from Al they won't be even interested in the little fuss that Moore's charge has raised in Al's mind. He hasn't got a problem. He is only dealing with a tiny incident that makes a foreman's job so interesting and human.

Arthur Silvester
*Niantic, Conn.*

•

### SERIOUS BUSINESS

IT DOES not hurt plant discipline to make the box score sheet for daily baseball games accessible to the workers. Having a score sheet at each end of the shop, so most of the men can see them without leaving their machines, is a good way to handle the annual problem of the baseball season and its effect on its followers in the shop.

In our shop, having the score announced over the public address system, inning by inning, met all the needs of the sports hungry workers, and still kept production at its normal status. We have found out that nearly all workers are baseball fans, and it was in the best interest of the health and well-being of the workers that the means of following the course of the games was furnished.

Here in Philadelphia, it was fortunate for the well-being of the majority of the citizens of the city that the Phillies played their last game of the season when they did. Sitting up until midnight and after, listening to those young demons of the diamond slug their way from behind, put a great strain on the average worker. It was easier to count those who did not fall victim to this midnight and daily listening than those who did. Early-evening firm resolves to switch off the radio at 11 o'clock, no matter what, were shattered as the hour arrived, and the pennant-hungry team was locked in a thrilling battle in St. Louis or Pittsburg.

And if past performances are any indication of future occurrences, there will be a repetition of the same activities among baseball fans in the plant. If the plant does not furnish the baseball scores during the

# 14 Years Service

## yet only $42 in PARTS, 40 HOURS LABOR . . . and that's all

**MINSTER Press Performance Report**

**No. 40-6-½—2162**

- 150 tons • 8" stroke
- Single crank straight side
- Single geared
- Bolster area 44" x 27"
- 33 strokes per minute
- Equipped with Minster Air-Operated Combination Friction Clutch and Brake

**Once again, a Minster Press with Minster's Air-Operated Combination Friction Clutch and Brake makes a remarkable performance record.**

Not three years . . . not four . . . but fourteen long years this Minster press has been demonstrating its worth. During those fourteen years in a Minneapolis plant over 30,000 production hours were recorded . . . over 15,000,000 strokes were made.

And yet, total repair expense for the entire period has been but $42 in parts and 40 hours in repair maintenance. Specifically, eight years after installation, 8 segments of brake lining, 1 brake stud, 1 brake stud nut, and 2 lock washers were replaced. And that has been the only maintenance charged to this press.

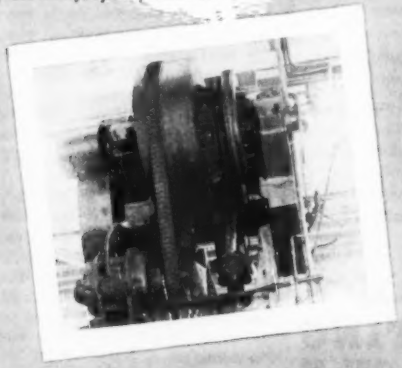
Can your present presses match this dependability? They can if you operate Minster presses for such performance is not unusual with Minster. In fact, we have reports of many presses operating ten years and longer where the clutch has never been disassembled . . . others where total repair expense is an absolute zero.

How would you feel if your presses rewarded you with such trouble-free service? Probably exactly like the superintendent of the plant where this press is operating, who reports: *"Because of the outstanding performance of Minster presses, we have purchased twelve additional presses in various sizes and types."*

And he further adds: "To date we have experienced no major difficulty with any of our Minster equipment."

**The best test of any press and its clutch is its *performance*. For the finest performance built into a press today, specify *Minster*.**

**Above right . . . Minster 150 ton, straight side single crank, single back-geared press. Used for drawing, coning, and perforating operations.**



**Left . . . close-up of Minster's Combination Friction Clutch and Brake.**

**THE MINSTER MACHINE COMPANY, MINSTER, OHIO**

**MINSTER**
FIRST IN *Press* DESIGN

# On cut-off jobs...

*This is the saw that* **SAVES**

**TIME . . . MONEY . . . MANPOWER**

Wells No. 8 with wet cutting system

**WELLS No. 8**

**METAL CUTTING BAND SAW**

WHETHER it's for production, general utility or both, the Wells No. 8 is an investment that will pay for itself.

**TIME SAVINGS**—Continuous cutting band saw action means blade is cutting *all* the time . . . portability feature means saw can be moved from job to job.

**MANPOWER SAVING**—Easy to set up and easy to operate, a Wells No. 8 does not require specially trained personnel . . . does not require attention during cutting.

**MONEY SAVINGS**—First cost is low; operating costs are low . . . band type blade removes minimum stock, cuts accurately to minimize rejects.

These savings can mean a lot in any shop . . . why not find out what they can mean to you. The Wells No. 8 has a capacity 8″ x 16″, rectangular, 8″ dia., rounds. It is powered by a heavy duty ½ H.P. motor. Other sizes also available. For automatic repetitive cutting of identical lengths, the Wells No. 8 can be furnished with the Wells-O-Bar Feed Master. See your Wells Dealer for further information or write for literature.

Wells SAWS

Wells

*Products by Wells are Practical*

**METAL CUTTING BAND SAWS**

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT ROAD, THREE RIVERS, MICH.


day, the men will keep sneaking over to phone outside sources to find out how the home team is doing. That is where the accessible score card or publicly announced scores over the plant speaker system will keep the men at their machines instead of roaming around to get the latest dope.

Giving the workers the baseball scores is not pampering them. It's good for morale because it shows them that the company understands the basic need most men possess to keep up with the doings of the home team during the original World Series season. Instead of undermining discipline, it will give it a boost, if the men are shown that the company they work for treats them like human beings and keeps them happy.

It is well to remember that the proper proportion of both work and play make a good worker. He is able to produce better with the added stimulus of wise participation in sports.

Harry Kaufman
*Philadelphia*

•

## SKILL STEALER

AL IS LOSING men to a competitor's place. It is too bad for Harrison—he has to train new men to do the job. And while training new men, production is curtailed. It puts Harrison in a spot. What can he do, or what can any man in his place do? Why are the men leaving to another place? If it would be one man, we could say that he wanted to change. But it is not one man, it is several who left. There must be a reason. First does Harrison have the ability to have men work under him. Can he get along with men? Is he a bully who thinks that he is the boss and the rest are only underlings, that they have to do what he tells them or he will put them in their place by his fist or club? What about working conditions of the place? Is it equal to Gribbons'? Is the place clean, roomy, well ventilated. How is the pay? What advantages have you got to keep a man on the job? Will he, after working so many years, reach the top pay? Do you have any insurance that a man will lose out when he quits? Will the man that works and shows his capability be recognized and rewarded? You see everything is to be considered. No man will leave a good place for another if he will not gain something in doing so.

Under our free-enterprise system you make it attractive to your men to stay on the job in times like now

# 10,000 Attend Air Force Prime Contractors' Exhibit in Chicago

CHICAGO—More than 10,000 representatives of small business firms seeking subcontracting work attended the Air Materiel Command's prime contractor's exhibit at the Navy Pier from Monday, April 30, through Wednesday, May 9. Sponsored by the Midcentral Air Procurement District, the 50,000-sq ft show included exhibits by 76 business firms and eight government agencies. Among those attending were visitors from 30 states, including representatives of firms located as far away as New York, Texas and California.

Types of work for which subcontractors are wanted by some of the exhibitors are listed below:

### ALLISON DIVISION

Contractors who can supply steel and aluminum alloy forgings suitable for use in jet aircraft engines are wanted by Allison Div., General Motors Corp., Indianapolis. They also are looking for subcontractors equipped to machine aluminum and magnesium alloy castings, and alloy steel screw machine parts to precision tolerances. Contact: R. E. Swords, purchasing agent, Plant 2, and C. J. Kelly, purchasing agent, Plant 5.

### BELL AIRCRAFT COMPANY

Displaying parts for Bell helicopters, Boeing jet engine nacelle pods, for which they have prime contracts, and for other aircraft products, Bell Aircraft Co., P. O. Box 1, Buffalo 5, N. Y., wants additional suppliers of precision gears both ground and shaved, as well as subcontractors equipped to machine steel and aluminum forgings to close tolerances with fine finishes. Write to: Outside Production Department.

### CLEVELAND PNEUMATIC TOOL CO.

Having prime contracts to make landing gear assemblies for large planes like the B-36, B-47 and B-50 bombers, the C-119 and C-124 cargo planes, and other aircraft, The Cleveland Pneumatic Tool Co. wants subcontractors equipped to machine individual parts complete. Particularly need subcontractors having large-swing, gap-type turret lathes and cylindrical grinders for machining large forgings. Also need additional sources for alloy steel forgings of aircraft quality. Contact: C. A. Russ, purchasing department.

### EMERSON ELEC. MFG. CO.

Subcontractors for making electronic apparatus and ammunition feed boxes are wanted by Emerson Electric Mfg. Co., St. Louis. Karl Guvernator is subcontract buyer.

### FOOTE BROS. GEAR & MACHINE CORP.

Facilities for thread milling, thread grinding, precision boring, precision milling, contour milling, angle and taper turning, and sheet metal fabrication are being sought by Foote Bros. Gear & Machine Corp., Chicago. Work to be done involves the machining of aluminum and magnesium alloy castings, the machining of alloy steel screws and shafts, and the production of sheet metal assemblies. Write to: I. C. Maust, sales manager.

### GENERAL MILLS, INC.

Parts for precision computing instruments and bombsights will be subcontracted by the Mechanical Div. of General Mills, Inc., Minneapolis, Minn. Work to be done by subcontractors includes the production of small, fine-tooth gears, and the machining of small castings and forgings to extremely close tolerances. L. H. Muschamp is purchasing agent for the Mechanical Div.

### KEARNEY & TRECKER CORP.

Subcontractors capable of machining cast iron parts for vertical and horizontal milling machines are wanted by Kearney & Trecker Corp., Milwaukee. They need particularly machine time on large bar machines, large radial drills, and large planers. Kearney & Trecker will furnish castings, and all special tooling, including necessary jigs and fixtures. Prefer subcontractors located in Middle West. Write to Robert P. Knutson or Sherman Delker, purchasing.

### LEAR INCORPORATED

Subcontractors equipped to perform precision machining operations on small parts, including small aluminum and magnesium alloy castings and alloy steel parts, are wanted by Lear Inc., Grand Rapids, Mich. Contact: R. S. Thies, director of purchases.

### McDONNELL AIRCRAFT

McDonnell Aircraft Corp., St. Louis wants subcontractors capable of making control surfaces and lighter, less involved aircraft subassemblies, as well as subcontractors equipped to machine aluminum alloy and steel forgings to close tolerances. Write to: C. J. Wolf, purchasing agent, Outside Production.

### MINNEAPOLIS-HONEYWELL

Subcontractors equipped for producing screw machine parts, and for milling, drilling, turning and grinding small parts to extremely close tolerances are needed by the Aeronautical Div. of Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. Contact: K. K. Roby or R. J. Henry, Subcontract Dept.

### NASH MOTORS

When production is started on the Pratt & Whitney R-2800 Double Wasp aircraft engines for which it has a large prime contract, Nash Motors Div., Nash-Kelvinator Corp., Kenosha, Wis., will need subcontractors to machine parts. Despite a $7.5 million building program, production capacity will not provide adequate manufacturing space and a great number of parts and subassemblies will be subcontracted. Write to: Aircraft Engine Div.

### SOLAR AIRCRAFT

Subcontractors equipped to make large stainless steel forgings, stainless steel screw machine parts, and rolled and welded rings, are wanted by Solar Aircraft Co., Des Moines, Iowa. Contact: E. D. Needham, purchasing agent.

### SUNDSTRAND

The Hydraulic Div. of Sundstrand Machine Tool Co. later this year will be looking for subcontractors to make precision alloy steel, bronze and aluminum alloy parts for hydraulic pumps and transmissions. This division now has enough capacity for present needs but expects to have to subcontract a number of parts to meet increased production schedules six months to a year from now. Write to: Eric Theden, subcontracting manager.

# 396 Defense Plants Get Certificates of Necessity

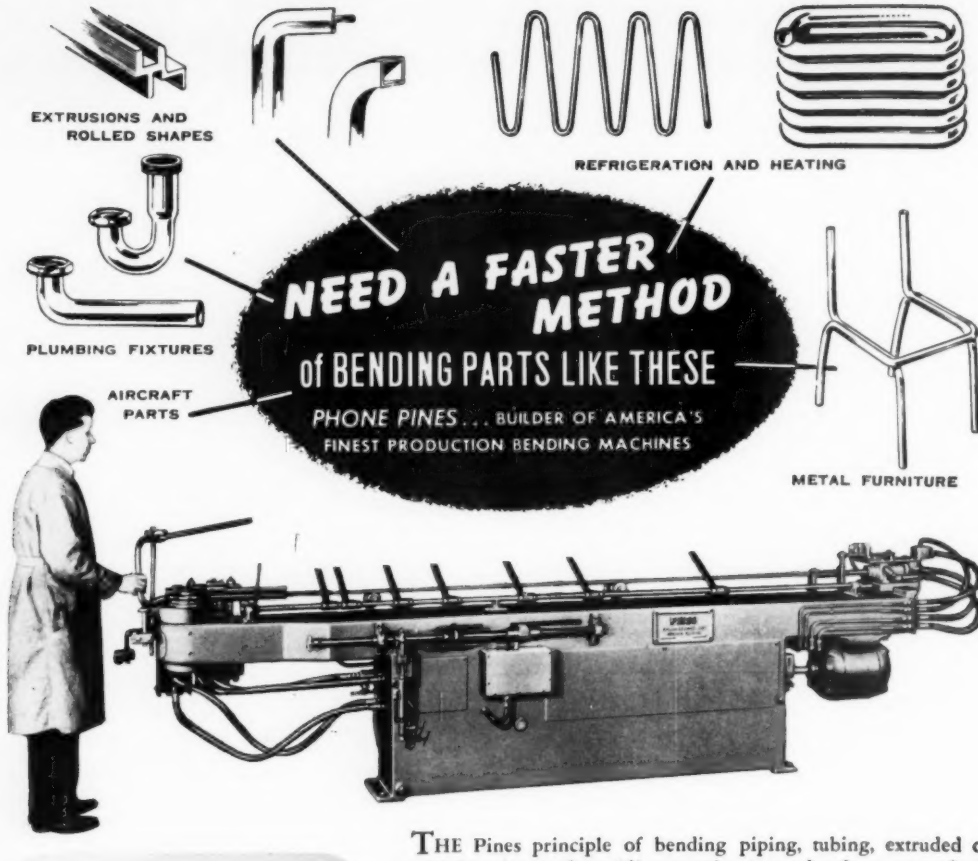
WASHINGTON—Certificates of necessity to encourage construction of 396 new or expanded defense facilities costing an estimated $1,310,799,399 have been issued by the Defense Production Administration between March 7 and April 6.

The certificates authorize holders to deduct from taxable income from 40 to 100% of the cost of the facilities during the next five-year period. The normal period for amortization of facilities allowed by the Bureau of Internal Revenue for tax purposes is 20 to 25 years.

Following is a partial list of metalworking firms that have obtained certificates. The balance of the list will appear in the next issue of *AM*.

| Name of company, location of facilities | Product or service | Amount applied for | Percentage certified |
|---|---|---|---|
| **Continental Machines, Inc.** Savage, Minn. | Sewing machines, metal cutoff machines, gage blocks, special gages | $262,250 | 85 |
| **Onsrud Machine Works, Inc.** Chicago, Ill. | Metalworking machinery (aircraft) | $26,629 | 90 |
| **Three M Tool and Die Co.** York, Pa. | Machine tools, dies | $15,000 | 75 |
| **Swan Engineering & Machine Co.** Bettendorf, Iowa | Tools, dies, jigs and fixtures | $26,194 | 80 |
| **Jefferson Engineering & Mfg. Co.** Detroit, Mich. | Tank track components | $118,782 | 85 |
| **Hobart Brothers Company** Troy, Ohio | Electric arc welders, power plant | $13,787 | 75 |
| **Dresel-Betz Company** Belleville, Ill. | Dies, jigs and fixtures | $44,461 | 90 |
| **Harvey Machine Co.** Kalispell, Mont., and in Northwest | Aluminum pig, Bauxite | $95,000,000 | 85 |
| **Reynolds Metals Co.** Corpus Christi, Tex. | Aluminum | $79,665,278 | 80 |
| **Aluminum Company of America** | Primary aluminum | $60,000,000 | 80 |
| **Jackson Iron & Steel Co.** Jackson, Ohio | Silvery pig iron | $2,438,550 | 85 |
| **Timken-Detroit Axle Co.** Detroit, Mich. | Axles for military vehicles | $732,302 | 90 |
| **Timken-Detroit Axle Co.** Oshkosh, Wis. | Axles for military vehicles | $429,014 | 80 |
| **Timken-Detroit Axle Co.** Ashtabula, Ohio | Axles for military vehicles | $4,878 | 75 |
| **Timken-Detroit Axle Co.** Kenton, Ohio | Axles for military vehicles | $49,760 | 85 |
| **Timken-Detroit Axle Co.** New Castle, Pa. | Axles for military vehicles | $309,970 | 80 |
| **Cleveland Pneumatic Tool Co.** Cleveland, Ohio | Airplane landing gear | $702,231 | 80 |
| **Cleveland Pneumatic Tool Co.** Cleveland, Ohio | Airplane landing gear | $375,000 | 75 |
| **Sylvania Electric Products, Inc.** Burlington, Iowa | Subminiature electron tubes | $4,277,322 | 75 |
| **Solar Aircraft Co.** Des Moines, Iowa | Aircraft engine parts | $1,750,000 | 75 |
| **Solar Aircraft Co.** San Diego, Calif. | Manifold banks for aircraft engine | $23,486 | 85 |
| **Solar Aircraft Co.** San Diego, Calif. | Hood for aircraft engine | $1,250 | 75 |
| **Solar Aircraft Co.** San Diego, Calif. | Parts for jet engines | $109,347 | 85 |
| **Solar Aircraft Co.** San Diego, Calif. | Aircraft engine parts | $158,549 | 75 |
| **Solar Aircraft Co.** Des Moines, Iowa | Aircraft engine parts | $15,284 | 85 |
| **Sylvania Electric Products, Inc.** Towanda, Pa. | Tungsten & molybdenum (wire, powder, sheet) | $2,899,335 | 80 |
| **Sylvania Electric Products, Inc.** Warren, Pa. | Electron tubes | $790,695 | 80 |
| **Solar Aircraft Co.** San Diego, Calif. | Aircraft engine components | $152,653 | 80 |
| **St. Joseph Lead Co. of Pennsylvania** Josephtown, Pa. | Slab zinc | $1,468,070 | 75 |
| **Randolph Metals Co.** Canton, Mass. | Slab zinc | $49,753 | 75 |
| **Manasco Manufacturing Co.** Burbank, Calif. | Hydraulic landing gears | $771,634 | 80 |
| **Ahlberg Bearing Co.** Chicago, Ill. | Ball bearings | $550,000 | 85 |
| **Torrington Co., Inc. of Indiana** South Bend, Ind. | Anti friction bearings | $312,549 | 85 |
| **Tyson Bearing Corp.** Massillon, Ohio | Roller bearings | $71,515 | 90 |
| **W. J. Bullock, Inc.** Birmingham, Ala. | Secondary aluminum, zinc, brass | $765,000 | 75 |
| **George Sall Metals Co., Inc.** Undecided | Non-ferrous metals | $665,000 | 75 |
| **Ohio Steel Foundry Co.** Lima, Ohio | Steel rolling-mill rolls | $1,001,622 | 80 |
| **Lebanon Steel Foundry** Lebanon, Pa. | Armor castings for tanks | $891,591 | 75 |
| **Tyson Bearing Corp.** Massillon, Ohio | Roller bearings | $1,145,000 | 90 |
| **United Drill & Tool Corp.** (Whitman & Barnes Division) Plymouth, Mich. | Cutting tools, drills | $133,617 | 90 |
| **Champion Forge Co.** Cleveland, Ohio | Steel drop forgings | $470,296 | 80 |
| **Stratos Division, Fairchild Engine & Airplane Corp.** Farmingdale, L. I., N. Y. | Ground air conditioner | $36,309 | 85 |
| **Fairchild Engine & Airplane Corp.** Farmingdale, L. I., N. Y. | Ordnance | $11,202 | 85 |
| **Fairchild Engine & Airplane Corp.** Farmingdale, L. I., N. Y. | Aircraft engines | $5,979 | 75 |
| **Ford Motor Co.** Cincinnati, Ohio | Oil pump assemblies | $2,925,577 | 75 |
| **General Motors Corp.** Saginaw, Mich. | Ball bearing adjustors | $235,760 | 90 |
| **General Motors Corp.** Flint, Mich. | Spark plugs | $40,275 | 75 |
| **Menasco Mfg. Co.** Burbank, Calif. | Landing gears | $350,000 | 75 |
| **General Motors Corp.** Grand Rapids, Mich. | Aircraft engine parts | $1,598,000 | 75 |
| **General Motors Corp.** Harrison, N. J. | Roller bearings | $276,672 | 90 |
| **Good-All Electric Mfg. Co.** Ogallala, Nebr. | Metal-clad condensers | $200,000 | 75 |
| **Mechanics Universal Joint Div. of Borg-Warner Corp.** Rockford, Ill. | Joint assemblies for aircraft | $150,000 | 75 |
| **Kaiser Aluminum & Chemical Corp.** Mead, Wash. | Aluminum pig | $5,870,500 | 80 |
| **Kaiser Aluminum & Chemical Corp.** Mead, Wash. | Aluminum pig | $364,006 | 80 |
| **Titeflex, Inc.** Newark, N. J. | Radio and ignition components | $289,065 | 80 |
| **General Motors Corp.** Vandalia, Ohio | Propeller assembly | $180,655 | 90 |
| **Goodyear Aircraft Corp.** Akron, Ohio | Aircraft parts | $200,929 | 80 |
| **Reynolds Metals Co.** Jones Mills, Ark. | Aluminum pig | $4,300,000 | 80 |
| **Reynolds Aluminum Co.** Troutdale, Ore. | Aluminum pig | $475,450 | 80 |
| **Jones & Laughlin Steel Corp.** Aliquippa, Pa. | Pipe and tubing | $1,533,250 | 60 |
| **Jones & Laughlin Steel Corp.** Aliquippa, Pa. | Recovery of iron | $789,000 | 85 |
| **Boeing Airplane Co.** Seattle, Wash. | Aircraft and accessories | $4,941,916 | 85 |
| **Cornelius Co.** New Brighton, Minn. | Aircraft air compressors | $49,873 | 90 |
| **Bergen Wire Rope Co.** Lodi, N. J. | Field wire conductors | $60,000 | 75 |
| **Lycoming-Spencer Div. of AVCO Mfg. Corp.** Williamsport, Pa. | Throttle body assemblies | $20,675 | 90 |
| **Allegheny Ludlum Steel Corp.** Watervliet, N. Y. | Stainless steel | $3,200,000 | 70 |
| **Lockheed Aircraft Corp.** Burbank and Van Nuys, Calif. | Airplanes | $3,666,693 | 85 |
| **Heli Coil Corp.** Danbury, Conn. | Bushings, screw members, tools | $244,429 | 80 |
| **Jack & Heintz Precision Industries Inc.** Maple Heights, Ohio | Aircraft rotating electrical equipment | $410,900 | 90 |
| **Fairchild Engine & Airplane Corp.** Farmingdale, L. I., N. Y. | Aircraft engine parts | $12,357 | 75 |
| **Fairchild Aircraft Div. Fairchild Engine & Airplane Corp.** Hagerstown, Md. | Airplanes | $83,118 | 80 |
| **Jones & Laughlin Steel Corp.** Pittsburgh, Pa. | Steel plates, sheets, strip | $9,392,743 | 60 |
| **General Motors Corp.** Vandalia, Ohio | Actuators | $277,781 | 90 |

| Name of company, location of facilities | Product or service | Amount applied for | Percentage certified |
|---|---|---|---|
| **Consolidated Vultee Aircraft Corp.** San Diego, Calif. | Aircraft | $144,851 | 75 |
| **Wyman-Gordon Co.** Harvey, Ill. | Engine crank shafts | $4,848,200 | 80 |
| **Worthington Pump & Machinery Corp.** Piscataway Twshp., N. J. | Welding equipment | $211,470 | 90 |
| **National Steel Corp.** (Div. Weirton Steel Co.) Weirton, W. Va. | Pig iron, steel ingots, etc. | $422,895 | 85 |
| **Polan Industries** Hunting, W. Va. | Glass bulbs, tubing & flares for tubes | $2,263,000 | 75 |
| **Larsen & Quigley Co.** Chicago, Ill. | Aircraft engine parts | $37,348 | 90 |
| **Thompson Industries, Inc.** Mineola, N. Y. | Ball bearings | $14,129 | 90 |
| **Aluminum Co. of America** (Alcoa Reduction Works) Alcoa, Tenn. | Primary aluminum | $912,900 | 80 |
| **United Aircraft Corp.** East Hartford, Conn. | Ordnance | $329,855 | 80 |
| **Jones & Laughlin Steel Corp.** Pittsburgh, Pa. | Steel | $379,600 | 75 |
| **Jones & Laughlin Steel Corp.** Pittsburgh, Pa. | Steel ingots | $104,600 | 75 |
| **Bloom Engineering Co., Inc.** Pittsburgh, Pa. | Equip. for indus. furnaces, pipe insulation material | $165,080 | 80 |
| **B G Corp.** Ridgefield, N. J. | Spark plugs | $1,400,000 | 75 |
| **Engineering Reproduction Inc.** Detroit, Mich. | Reproduction of drafts for engineering | $95,000 | 75 |
| **Talley Machine & Mfg. Corp.** Los Angeles, Calif. | Machine work (aircraft parts) | $27,434 | 90 |
| **Heim Co.** Fairfield, Conn. | Special bearings | $20,878 | 90 |
| **H. Levine Cooperage** Vernon, Calif. | Reconditioning of steel drums | $267,659 | 50 |
| **Research Welding & Engineering Co.** South Gate, Calif. | Tank assemblies and aircraft | $16,500 | 90 |
| **National Grinding Wheel Co., Inc.** Tonowanda, N. Y. | Abrasive products | $295,117 | 75 |
| **General Motors Corp.** Cleveland, Ohio | Diesel engine | $1,744,282 | 75 |
| **Worthington Pump & Machinery Corp.** Harrison, N. J. | Pumps | $285,906 | 85 |
| **Slabe Machine Products Co.** Cleveland, Ohio | Aircraft engine parts | $23,885 | 90 |
| **Greer Hydraulics Inc.** Brooklyn, N. Y. | Testing equip. | $335,000 | 75 |
| **Lufkin Foundry & Machinery Co.** Lufkin, Texas | Oil pumping units | $100,000 | 75 |
| **Litton Industries** San Carlos, Calif. | Magnetron tubes | $260,227 | 85 |
| **Fitzgibbon Boiler Co., Inc.** Oswego, N. Y. | Hulls for tanks | $1,750,000 | 75 |
| **Minneapolis-Honeywell Regulator Co.** Philadelphia, Pa. | Instruments for measuring, recording | $750,000 | 75 |
| **Powers Regulator Co.** Skokie, Ill. | Process control apparatus, valves | $2,378,390 | 75 |
| **Euclid Road Machinery Co.** Euclid, Ohio | Scrapers, loaders | $2,017,762 | 50 |
| **Goodyear Aircraft Corp.** Akron, Ohio | Airplane wheels | $269,690 | 85 |
| **Hartford Machine Screw Co.** Windsor, Conn. | Aircraft engine parts | $428,402 | 85 |
| **Hardinge Bros., Inc.** Elmira, N. Y. | Lathes | $128,957 | 85 |
| **Aluminum Co. of America** Port Lavaca, Texas | Primary aluminum | $43,564,618 | 80 |
| **Mechanics Universal Joint Division** Memphis, Tenn. | Joint assemblies for combat vehicles | $270,000 | 75 |
| **Red Bank Division** Red Bank, N. J. | Dynamotors | $142,377 | 85 |
| **Fries Instrument Div.** Towson, Maryland | Measuring instruments | $93,861 | 85 |
| **Bendix Radio Div. of Bendix Radio Corp.** Towson, Md. | Aircraft communications and radar equipment | $1,026,882 | 75 |
| **Dana Corp.** Marion, Ind. | Transmission devices | $5,825,822 | 75 |
| **Fairfield Mfg. Co.** Lafayette, Ind. | Worm gears | $2,930,889 | 75 |
| **W. R. Cranes Co.** Verona, Wis. | Metal fabrication and construction | $35,000 | 75 |
| **Carborundum Co.** Calvert City, Ky. | Aluminum oxide | $3,273,000 | 50 |
| **American Electric Motors, Inc.** Los Angeles, Calif. | Gyroscope motors, aircraft | $22,635 | 85 |
| **Karl Douglas Co.** Inglewood, Calif. | Fabrication of aircraft landing gear | $20,588 | 90 |
| **American District Steam Co., Inc.** North Tonowanda, N. Y. | Foundry building & equipment | $473,162 | 80 |
| **Gerotor May Corp.** Baltimore, Md. | Hydraulic valves | $203,680 | 85 |
| **Brown & Root, Inc.** Houston, Texas | Rebuilding tanks | $329,933 | 75 |
| **Strom Steel Ball Co.** Cicero, Ill. | Steel balls | $915,000 | 80 |
| **Gerotor May Corp.** Baltimore, Md. | Valves, pumps | $42,895 | 75 |
| **Granite City Steel Co.** Granite City, Ill. | Pig iron, steel ingots | $71,250,000 | 80 |
| **Wm. L. Gilbert Clock Corp.** Winsted, Conn. | Timing units, fuses | $4,693 | 85 |
| **Kaiser Aluminum & Chem. Corp.** Moss Landing, Monterey Co., Calif. | Periclase, magnesium oxide, dolomite | $915,472 | 70 |
| **Indiana Gear Work, Inc.** Indianapolis, Ind. | Aircraft gear units | $94,535 | 85 |
| **Peerless Tool & Engineering Co.** Chicago, Ill. | Precision machining & fabricating aircraft engine components | $149,087 | 90 |
| **Wyckoff Steel Co.** Chicago, Ill. | Steel bars and shapes | $685,350 | 60 |
| **Wyckoff Steel Co.** Ambridge, Pa. | Steel bars, carbon and alloys | $118,385 | 60 |
| **Manlove Mfg. Co.** Los Angeles, Calif. | Aircraft valves | $10,989 | 90 |
| **Monarch Steel Co.** Hammond, Ind. | Steel bars | $300,000 | 60 |
| **Wisconsin-Appleton Co.** South Milwaukee, Wis. | Iron castings | $1,293,419 | 75 |
| **Metal Fabricators Corp.** Waltham, Mass. | Aircraft engine parts | $29,000 | 75 |
| **Cameron Iron Works, Inc.** Houston, Tex. | Forged and rough machined beech rings | $2,915,417 | 75 |
| **Bendix Products Div.** Bendix Aviation Corp. South Bend, Ind. | Aircraft landing gear | $1,196,843 | 80 |
| **Stoner Mfg. Co.** Aurora, Ill. | Brass cartridge cases | $144,649 | 75 |
| **Lake Erie Engineering Corp.** Tonowanda, N. Y. | Hydraulic presses | $271,758 | 80 |
| **National Radiator Co.** Danville, Pa. | Iron powder | $4,617,530 | 60 |
| **Greenback Metal Powder Co., Inc.** Dayton, Ohio | Iron powder | $4,741,605 | 60 |
| **Bower Roller Bearing Co.** Detroit, Mich. | Roller bearings | $2,247,686 | 85 |
| **Stanley Works** New Britain, Conn. | Cold rolled steel | $906,182 | 60 |
| **Chrysler Corp.** Detroit, Mich. | Rear axle housings | $196,991 | 90 |
| **Johns Hartford Tool Co., Inc.** Hartford, Conn. | Aircraft engine parts | $8,038 | 90 |
| **United Aircraft Corp. Hamilton Standard Div.** Windsor Locks, Conn. | Aircraft propellers | $17,000,000 | 75 |
| **United Aircraft Corp. (Pratt and Whitney Aircraft Div.)** North Haven, Conn. | Aircraft engines and parts | $14,200,000 | 75 |
| **United Aircraft Corp. (Pratt and Whitney Aircraft Div.)** East Hartford, Conn. | Aircraft engines | $8,400,000 | 75 |
| **Korhumel-Heffron and Preiss Steel Co.** Evanston, Ill. | Cold rolled spring steel | $1,182,904 | 60 |
| **Cold Metals Products Co.** Youngstown, Ohio | Strip steel | $1,287,800 | 60 |
| **Canton Drop Forging and Mfg. Co.** Canton, Ohio | Propeller extrusions | $114,306 | 75 |
| **Canton Drop Forging Mfg. Co.** Canton, Ohio | Forgings (Jet engines) | $250,000 | 75 |
| **SKF Industries, Inc.** Philadelphia, Pa. | Roller bearings and locknuts | $5,749,693 | 85 |
| **Los Angeles Die Casting Co.** Los Angeles, Calif. | Die castings | $17,554 | 75 |
| **Stover Lock Nut and Machinery Corp.** Easton, Pa. | Safety nuts, Tank track pins | $299,000 | 70 |
| **Latrobe Electric Steel Co.** Latrobe, Pa. | Tool steels (high speed) | $4,149,000 | 75 |
| **Pacific Piston Ring Co.** Los Angeles, Calif. | Aircraft valves | $30,303 | 90 |
| **American Brake Shoe Co.** Chicago, Ill. | Forgings for tank track, shell bodies | $219,442 | 80 |
| **Avon Tube Div. Higbie Mfg Co.** Rochester, Mich. | Electric-weld steel tubing | $209,240 | 60 |
| **Norma-Hoffman Bearings Corp.** Stamford, Conn. | Instrument ball bearings | $350,000 | 75 |
| **SKF Industries, Inc.** Shippenaburgh, Pa. | Roller, ball bearings, locknuts | $902,103 | 85 |
| **Eaton Manufacturing Co.** Battle Creek, Mich. | Blades for jet engines | $848,518 | 75 |

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# LATEST DEFENSE CONTRACTS

## ARMY ORDNANCE AWARDS

### Ordnance Tank-Automotive Center, Detroit

**Atlas Industries, Inc.**, Woodville, Ohio—link assembly, with bearing track idler wheel.

**Milwaukee Gear Co.**, Milwaukee, Wis.—pinion, rear forward axle, differential.

**Union Spring & Mfg. Co.**, New Kensington, Pa.—spring, volute track suspension.

**General Coach Works, Inc.**, Marlette, Mich.—trailer, house 32-ft and set of spare parts.

**Stamping Products Co.**, Detroit—ramp assembly.

**Hercules Engineering & Mfg. Co.**, Detroit—cab closure.

**International Harvester Co.**, Washington, D.C.—truck pickup, 1 ton 4x2.

**Butler Mfg. Co.**, Kansas City, Mo.—body, fuel tank.

**Kehrig Mfg. Co.**, Utica, Mich.—cab closure, hard top.

**Autocar Sales & Service Co.**, Ardmore, Pa.—truck, chassis, 10-ton.

**Cadillac Motor Car Div., General Motors Corp.**, Detroit—transmission assembly.

**Allis-Chalmers Mfg. Co.**, Milwaukee—transmission, assembly.

**Kenworth Motor Truck Corp.**, Seattle—buses, motor, 37-passenger; trucks, tractor, 10 ton and 6 ton; trucks, stake and platform, 4-ton.

**Chevrolet Motor Div., General Motor Corp.**, Detroit—trucks, panel delivery, ½ ton; trucks, panel delivery, 1 ton.

**Ford Motor Co.**, Washington, D.C.—trucks, pickup, ½ ton; heaters and defrosters.

**Curtis Mfg. Co.**, St. Louis—compressor, air, portable, gasoline-engine drive.

**Kellogg Div., American Brake Shoe Co.**, Rochester, N. Y.—compressor, air, non-portable.

**Fruehauf Trailer Co.**, Ft. Wayne, Ind.—semitrailer, cargo, 12-ton.

**Manley Mfg. Div., American Chain & Cable Corp.**, York, Pa.—crane, portable, floor type.

**Eidal Mfg. Co.**, Albuquerque, N. M.—semitrailer, stake & platform, 30-ton, emergency spare parts, dolly, trailer convertor.

**Fargo Motor Div., Chrysler Corp.**, Detroit—truck, carryall, 1-ton, 4x4; truck, stake and platform, 1-ton, 4x4.

**Electro Products Co.**, New York—tachometer, engine.

### Detroit Ordnance District

**Pontiac Motor Div., General Motors Corp.**, Pontiac, Mich.—carrier, cargo, amphibious, and concurrent spare parts.

**Zenith Carburetor Div., Bendix Aviation Corp.**—automotive spare parts.

**Allen Electric & Equipment Co.**, Kalamazoo, Mich.—charger, magnet.

### Ordnance Ammunition Center, Joliet, Ill.

**Peerless of America**, Chicago—renovation of firing pin assemblies.

**M. Lizer Mfg. Co.**, Chicago—renovation of firing pin assemblies.

**Electric Eye Equipment Corp.**, Danville, Ill.—testing machine for M51 plunger body; testing machine for M51 fuse body.

### Picatinny Arsenal, Dover, N. J.

**Communication Equipment & Engineering Co.**, Chicago—recording and calibrating unit.

**Aircraft-Marine Products Co.**, Harrisburg, Pa.—connectors, closed end, insulated, for rocket, 3.5 in.

**Westclox Div., General Time Corp.**, La Salle, Ill.—modification of M152 and M155 fuzes.

### Watervliet Arsenal, N. Y.

**Sandy Hill Iron & Brass Works**, Hudson Falls, N. Y.—cannon parts.

**General Slucing Machine Co.**, Walden, N. Y.—Cannon parts.

**Whiting Corp.**, New York — replacement part for 10 ton and 5 ton cranes.

**American Swiss Mfg. Co.**, Detroit — tool: ramming and extracting.

**Fallkill Machine Co., Inc.**, Poughkeepsie, N. Y.—cannon parts.

**Cameron Iron Works, Inc.**, Houston, Tex.—forgings.

### New York Ordnance District

**Pollak Engineering & Mfg. Corp.**, Newark, N. J.—machine tools and equipment for trap and spacer assemblies.

**Mergenthaler Linotype Co.**, Brooklyn, N. Y.—range finder T41, including spare parts and furnishing of facilities.

## NAVY AWARDS

### U. S. Navy Purchasing Office, Washington 25, D. C.

**Chambersburg Engineering Co.**, Chambersburg, Pa.—hammers, steam drop.

**Cherry Rivet Co., Div., Townsend Co.**, Los Angeles—gun, hand type, contractor's.

**Duro Metal Products Co.**, Chicago—wrench sets, electrical, midget type VII, set of 11 pieces.

**All-Steel Equipment, Inc.**, Aurora, Ill.—trucks, shelf, hand drawn, all steel.

**Ohio Galvanizing & Mfg. Co.**, Niles, Ohio—trailers, warehouse 6000 lb capacity.

**Erie Foundry Co.**, Erie, Pa.—hammer, forging, steam double frame, 8000 lb.

**Vacu-Blast Co., Inc.**, San Mateo, Calif.—vacu-blasters, single unit, complete; Vacu-Veyor unloader unit.

**Rapids-Standard Co., Inc.**, Washington, D. C.—conveyors, gravity, wheel.

**West End Equipment Corp.**, West End, Wis.—trucks, pallet, hand propelled.

**Mercer Engineering Works, Inc.**, New York—trailers, truck, 10-ton capacity.

**Service Caster & Truck Co.**, Washington 25, D. C.—trucks, pallet, 6000-lb capacity.

### Naval Gun Factory, Washington 25, D. C.

**Electrix Corp.**, Pawtucket, R. I.—brackets, gas cylinder.

**Magnaflux Corp.**, Chicago—Magnaflux machines.

### Naval Construction Battalion Center, Porthueneme, Calif.

**National Heater Co.**, St. Paul, Minn.—oil fired heaters, space.

**Cook Bros. Equipment Co.**, Los Angeles—prototype wheeled cargo trailer.

**Elgin Sweeper Co.**, Elgin, Ill.—sweeper, street gasoline engine drive.

**Taco Heaters, Inc.**, Providence, R. I.—heaters, tankless, instantaneous type.

### Ships Parts Control Center, Mechanicsburg, Pa.

**Schutte & Koerting Co.**, Bucks County, Pa.—repair parts for valves on steam turbines.

**Allis-Chalmers Mfg. Co.**, Milwaukee—repair parts for pumps, motors, generators, and turbines.

**Foster Engineering Co.**, Union, N. J.—valves and valve repair parts.

**Snow-Nabstedt Gear Corp.**, Hamden, Conn.—repair parts for diesel engines.

**I-T-E Circuit Breaker Co.**, Philadelphia—various electrical repair parts.

**Cleveland Diesel Engine Div., General Motors Corp.**—repair part for diesel engines.

**Badger Mfg. Co.**, Cambridge, Mass.—repair parts for distilling plants.

**Maxim Silencer Co.**, Hartford, Conn.—mufflers for diesel engines.

**Bendix Aviation Corp., Pacific Div.**, North Hollywood, Calif.—electrode and base assemblies.

**Ingersoll-Rand Co.**, Philadelphia—repair parts for pumps and compressors.

**Sarco Co., Inc.**, New York—repair parts for valves.

### Bureau of Ships, Washington 25, D. C.

**United States Motors Corp.**, Oshkosh, Wis.—diesel generator sets.

**General Motors Corp.**, Detroit— diesel engines.

**Badger Mfg. Co.**, Cambridge, Mass.—distilling plant, vapor compression.

**Cutler-Hammer Inc.**, Milwaukee—motor controllers.

**General Electric Co.**, Washington, D. C.—turbine blading sets; equipment maintenance parts for radar indicating equipment.

**Westinghouse Electric Corp.**, Washington, D. C.—reduction gear.

**Hyde Windlass Co.**, Bath, Me.—windlass parts with Westinghouse Electric Corp. motor and control equipment.

## NAVY AVIATION AWARDS

### Bureau of Aeronautics, Washington 25, D. C.

**Jack & Heintz Precision Industries**, Cleveland—inverters.

**Aircraftsmen Co.**, Inglewood, Calif.—nestable external auxiliary fuel tanks.

**RCA Victor Div., Radio Corp. of America**, Camden, N. J.—altimeter.

**Cook Research Laboratories Div., Cook Electric Co.**, Chicago—cloud sensing instrument.

**Machines, Inc.**, Philadelphia—bomb shackles, bomb rack hooks.

**Landers, Frary & Clark**, New Britain, Conn.—feed heaters.

### Aviation Supply Office, Philadelphia

**Bendix Products Div., Bendix Aviation Corp.**, South Bend, Ind.—maintenance parts for carburetors.

**Regent Mfg. Co., Inc.**, Downey, Calif.—aviation jacks.

**C-O Two Fire Equipment Co.**, Newark, N. J.—extinguishers, wheeled portable; horn and nozzle assembly.

**Redco Tool Div., Red Lion Cabinet Co.**, Red Lion, Pa.—stand, engine overhaul and maintenance.

**Douglas Aircraft Co.**, Santa Monica, Calif.—tank assembly for R5D aircraft.

**Cleveland Pneumatic Tool Co.**, Cleveland—shock struts for use on various aircraft.

**Chance Vought Aircraft Div., United Aircraft Corp.**, Dallas—valve assembly for F4U-4-5 aircraft; jury strut wing assembly.

**Metallic Ladder Mfg. Corp.**, Alexandria, Va.—wheel assembly, solid tail for use on various aircraft.

**Grumman Aircraft Engineering Corp.**, Bethpage, L. I., N. Y.—hook assemblies, spare parts for F8F aircraft.

**Surface Combustion Corp.**, Toledo—heater assemblies.

**F. W. Lang Co.**, Philadelphia—refrigerators (reachin), shipboard type.

**Traulsen & Co., Inc.**, Long Island City, N. Y.—refrigerators (reach in), shipboard type.

**Jordan Refrigerator Co., Inc.**, Philadelphia—refrigerators (reach in), shipboard type.

**Emerson Mfg. Co.**, St. Louis—aviation armament maintenance & overhaul spares for use on Aero 9B turrets installed in P2V-5 aircraft.

(*Continued next page*)

## NAVY AVIATION . . . continued

**Pesco Products Div., Borg-Warner Corp.,** Bedford, Ohio—pump, fuel booster for F9F2, 3, aircraft.

**Westinghouse Electric Co.,** Philadelphia—generator, aircraft, FC; actuator, wing fold, for use on F2H-2N aircraft.

**General Electric Co.,** Philadelphia—airspeed switch for use on various aircraft; tachometer, generator.

**Gould National Batteries, Inc.,** Depew, N. Y.—batteries, storage, portable.

**Eclipse-Pioneer Div., Bendix Aviation Corp.,** Teterboro, N. J.—control, automatic engine, for use on F8F-2 aircraft; pump assembly, vacuum engine driven; maintenance parts for Pratt-Whitney engines including block assembly.

**Panoramic Radio Products, Inc.,** Mt. Vernon, N. Y.—panalyzor, Army-Navy type.

**Lavoie Lab., Inc.,** Morganville, N. J.—oscilloscope.

**Parker Appliance Co.,** Cleveland—valve, fuel electric operated, used for P4M-1 aircraft.

**Scintilla Magneto Div., Bendix Aviation Corp.,** Sidney, N. Y.—maintenance parts for Pratt & Whitney engines; magneto assembly; breaker assembly.

**S. G. Taylor Chain Co.,** Hammond, Ind.—welded chain, close link, proof coil.

**Fleck Co.,** Camden, N. J.—valves, flush type, water closet, bronze-nickel.

**Harrison Radiator Div., General Motors Corp.,** Lockport, N. Y.—oil cooler assembly for use on aircraft.

**General Laboratory Associates, Inc.,** Norwich, N. Y.—compositor, for use on engines.

**Electrical Engineering & Mfg. Corp.,** Los Angeles—motor, 26 volts, DC, 17,000 rpm.

**General Motors Corp.,** Rochester Products Div., Rochester, N. Y.—maintenance parts for use on regulators; bellows and lever assemblies, for F6F aircraft.

## AIR FORCE AWARDS

### Air Materiel Command, Wright-Patterson AF Base, Dayton

**United States Rubber Co.,** Detroit—aircraft assemblies.

**Friden Calculating Machine Co., Inc.,** Dayton—electric calculating machines.

**Standard Duplicating Machine Corp.,** Washington, D. C.—duplicating machines.

**Felt & Tarrant Mfg. Co.,** Dayton—calculating machines.

**Monroe Calculating Machine Co., Inc.,** Dayton—calculating machines.

**Marchant Calculating Machine Co.,** Dayton—calculating machines.

**Ditto, Inc.,** Dayton—duplicating machines.

**Eclipse-Pioneer Div., Bendix Aviation Corp.,** Teterboro, N. J.—aircraft transmitters; indicators; inverters; experimental generators.

**Pesco Products Div., Borg-Warner Corp., Bedford, Ohio**—pump maintenance parts.

**Lanagan & Hoke, Inc.,** Philadelphia—multimeters.

**Phaostron Co., South** Pasadena, Calif.—control panels.

**Fairchild Camera & Instrument Corp.,** Jamaica, N. Y.—echo boxes.

**Leland Electric Co.,** Dayton—inverters.

**Vendo Co.,** Kansas City, Mo.—control panels.

**Rainford Mfg. Co., Inc.,** New York—sea water distillation kits.

**Baldwin Co.,** Cincinnati—electrical pulse analyzers.

**Fletcher Aviation Corp.,** Pasadena, Calif.—aluminum fuel tanks.

**Eicor, Inc.,** Chicago—alternators.

**U. S. Gauge Div., American Machine & Metals, Inc.,** Sellersville, Pa.—indicators; hydraulic gages.

**Pacific Airmotive Corp.,** Burbank, Calif.—aircraft cycle reconditioning.

**AiResearch Mfg. Co.,** Los Angeles—turbine regulators.

**Cincinnati Electronics, Cincinnati**—receivers.

**North American Aviation, Inc.,** Los Angeles—aircraft spare parts; F-86 airplanes; miscellaneous assemblies.

**Lear, Inc.,** Grand Rapids, Mich.—training parts.

**Solar Aircraft Co.,** San Diego—aircraft spares.

**Curtiss-Wright Corp., Propeller Div.,** Caldwell, N. J.—kit assemblies.

**Ryan Industries, Inc.,** Detroit—dispensers.

**Durham Aircraft Service,** Woodside, N. Y.—aircraft parts.

**Columbia Broadcasting Co.,** New York—negative receiving television console.

**Aeroprojects, Inc.,** West Chester, Pa.—ultrasonic energy.

**Canadian Commercial Corp.,** Washington, D. C.—telegraph carrier equipment.

**Utica Drop Forge & Tool Corp., Utica, N. Y.**—machinery & equipment.

**Battelle Memorial Institute,** Columbus, Ohio—cracking in high strength weld metals.

**American LaFrance Foamite Corp.,** Elmira, N. Y.—trucks.

**A. C. Spark Plug Div., General Motors Corp.,** Milwaukee—machinery and equipment.

**Consolidated Vultee Aircraft Corp.,** Ft. Worth, Tex.—machinery & equipment.

**Mines Equipment Div.,** St. Louis, Mo.—cable assembly.

**Scintilla Magneto Div., Bendix Aviation Corp.,** Sidney, Ohio—ignition analyzers.

**Marlin-Rockwell Corp.,** Jamestown, N. Y.—ball bearings.

**New Departure Div., General Motors Corp.,** Bristol, Conn.—ball bearings.

**Graybar Electric Co., Dayton**—connector plugs.

**United Motors Service Div.,** General Motors Corp., Detroit—tractor spare parts.

**National Supply Co.,** Springfield, Ohio—350 kw power facility.

**Baldwin-Lima-Hamilton Corp.,** Philadelphia—600 kw power facility.

**Cleveland Diesel Engine Div., General Motors Corp.,** Cleveland—1000 kw power facility.

**Burroughs Adding Machine Co.,** Detroit—machinery and equipment.

**Swank, Inc.,** Attleboro, Mass.—container assembly.

**B. T. Crump Company, Inc.,** Richmond, Va.—container assembly.

**Denison Engineering Co.,** Columbus, Ohio—propeller kit assembly.

**Steelcraft Mfg. Co.,** Rossmayne, Ohio—stand assembly.

**Aircooled Motors, Inc.,** Syracuse, N. Y.—machinery and equipment.

**Lockheed Aircraft Corp.,** Burbank, Calif.—aircraft spare parts.

**Aircraft Tapered Sheet, Inc.,** Los Angeles—machinery & equipment.

**Greer Hydraulics, Inc.,** Brooklyn—stand assembly; fuel pump assembly.

**Buckeye Iron & Brass Works,** Dayton—fuel servicing nozzle.

**Minister Machine Co.,** Minister, Ohio—double crank presses.

**McLean Development Laboratories, Inc.,** Dallas, Tex.—bomb rack assembly.

**Chicago Aerial Survey Co.,** Chicago—camera parts.

**Aerojet Engineering Corp.,** Azusa, Calif.—rocket facilities.

**Bendix Products Div., Bendix Aviation Corp.,** South Bend, Ind.—aircraft spare parts; landing gear facilities.

**Century Tool & Mfg. Co.,** Rockford, Ill.—heater aircraft.

**Jack & Heintz Precision Industries,** Cleveland—instrument spare parts; inverters.

**North Electric Mfg. Co.,** Galion, Ohio—telephone network.

**Cornell Aeronautical Laboratory, Inc.,** Buffalo—exchanger assembly.

**Bell & Howell Co.,** Chicago—cameras.

**Federal Motor Truck Co.,** Detroit—spare engine and body parts.

**Lipe Rollway Corp.,** Syracuse, N. Y.—truck spare parts.

**Radioplane Co.,** Van Nuys, Calif.—aircraft target and autopilots.

**Bendix Aviation Corp.,** Pacific Div., North Hollywood, Calif.—valves.

**Chase Aircraft Co.,** West Trenton, N. J.—aircraft spare parts.

**Glenn L. Martin Co.,** Baltimore, Md.—airplane repair.

**Pratt & Whitney Aircraft Div.,** United Aircraft Corp., Hartford, Conn.—engine trainers.

**Sperry Gyroscope Corp.,** Great Neck, L.I., N.Y.—transmitter repair.

**Beech Aircraft Corp.,** Wichita, Kans.—aluminum wing tip tanks.

**General Electric Co.,** Schenectady, N. Y.—turbosuperchargers; indicators; arc welders.

**Minneapolis-Honeywell Regulator Co.,** Minneapolis—training supplies.

**Airpath Instrument Co.,** St. Louis—compass assemblies.

**Kollsman Instrument Corp.,** Elmhurst, N. Y.—instrument parts; indicators; machmeter assemblies.

**Fletcher Aviation Corp.,** Pasadena, Calif.—aluminum fuel tanks.

**Boeing Airplane Co.,** Seattle—airplanes; aircraft kits.

**Stratford Pen Corp.,** New York—control panels.

**Bowser, Inc.,** Ft. Wayne, Ind.—aluminum drop tanks.

**American Stove Co.,** St. Louis, Mo.—aluminum drop tanks.

**Hammarlund Mfg. Co.,** New York—radio receivers.

**North American Phillips Co.,** Mt. Vernon, N. Y.—radio compass components.

**Central Commercial Industries, Inc.,** Lowrey Organ Div., Chicago—radio compass components.

**Westinghouse Electric Corp.,** Dayton, Ohio—generators.

**Union Switch & Signal Co.,** Swissvale, Pa.—bomb tails.

**Bell Aircraft Corp.,** Wheatfield, N. Y.—spare parts.

**Federal Aircraft Works,** Minneapolis—aircraft ski assemblies.

**Technicraft Corp.,** Kansas City, Mo.—radio compass components.

**Vendo Co.,** Kansas City, Mo.—airspeed tubes.

**Lewis Engineering Co.,** Naugatuk, Conn.—temperature indicators.

**Franklin Machine Product Co.,** New York—tow target.

**Western Electric Co., Inc.,** New York—amplifiers, power and wave meter sets.

**Bendix Radio Div., Bendix Aviation Corp.,** Baltimore—loop antenna.

**Piqua Engineering, Inc.,** Piqua, Ohio—antenna system.

**B. F. Goodrich Co.,** Akron—wheel assemblies.

**U-Graph Sales Co.,** Newark, N. J.—overhead projectors and parts.

**Remington-Rand Inc.,** Dayton—calculating machines.

**Air Associates, Inc.,** Teterboro, N. J.—commercial hardware.

**S. Buchsbaum & Co.,** Chicago—aircraft kits, container assembly.

**Douglas Aircraft Co., Inc.,** Santa Monica, Calif.—truck mounted portable ramp.

**New Hampshire Ball Bearing, Inc.,** Peterborough, N. H.—ball bearings.

**Airquipment Co.,** Burbank, Calif.—stand assembly.

**B. G. Corp.,** New York—aircraft spare parts.

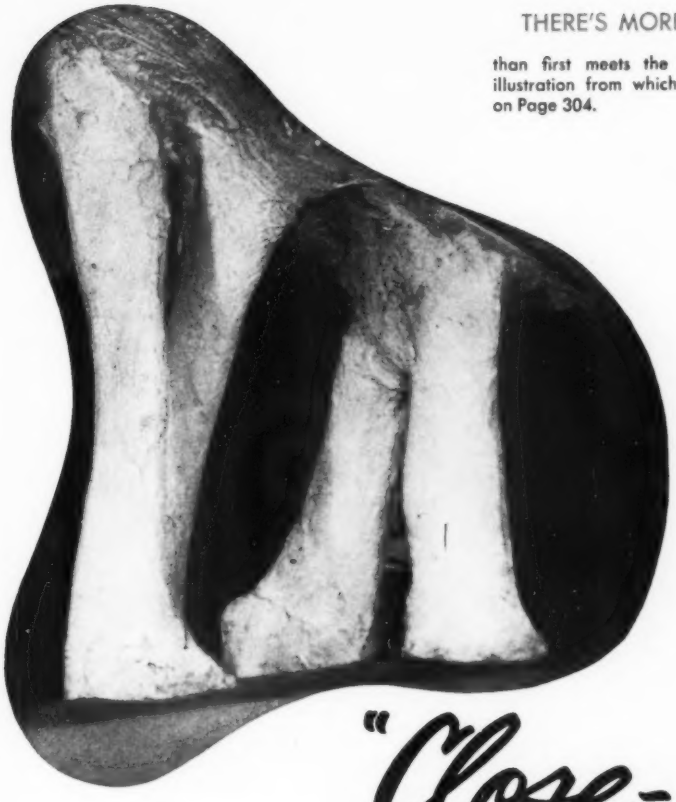
**Wright-Aeronautical Corp.,** Wood-Ridge, N. J.—engine parts; misc. aircraft repair tools; engine facilities.

## Increase Tooling for Jet Engines

NEW YORK—Engine Division of Fairchild Engine & Airplane Corp., Farmingdale, N. Y., is obtaining additional tooling to boost output of J-47 jet engine components. Much of the new tooling will be installed in the new Valley Stream plant, where forward and rear frame lines will be handled when the plant begins production in the summer. Fairchild has also received contracts substantially increasing the number of Fairchild C-119 Packets to be built for the Air Force and Navy.

THERE'S MORE TO THIS PICTURE

than first meets the eye. You'll find the entire illustration from which this enlargement was made on Page 304.



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. . . show you what goes on at Allied. Plant photographs, illustrating a wealth of modern equipment in five large factories, could only tell a small part of the story. You have to get *close* to many individual operations—in production, engineering or even clerical departments—to see the true picture of Allied's careful attention to even relatively unimportant details . . . all of which add up to good products and good service.

At Allied every phase of every job is *important*.

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DEPARTMENT C-58

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HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS • POWDERED METAL PARTS • SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST ALLITE ZINC ALLOY DIES • JIGS • FIXTURES • R-B INTERCHANGEABLE PUNCHES AND DIES

# SAY "WHEN"

## FOR ANY AMOUNT OF BRASS OR COPPER FOR DEFENSE ORDERS

Even though deliveries for civilian use are severely restricted, we can supply brass and copper for defense orders.

Call your local Chase warehouse for any size order of brass or copper. Our mill deliveries on large orders are favorable and our warehouses can often make delivery of some items from stock to fill "DO" orders.

There are 23 Chase warehouses in principal industrial cities throughout the country, and Chase mills in the east and midwest ready to serve you on your brass and copper requirements for defense. Call on these great Chase warehouse and mill facilities for service.

● **CHASE TECHNICAL SERVICE**

*Our technical engineers are familiar with military specifications for Brass & Copper for ordnance components, and will be glad to consult with you on the selection of these metals for defense orders.*

Chase **BRASS & COPPER**

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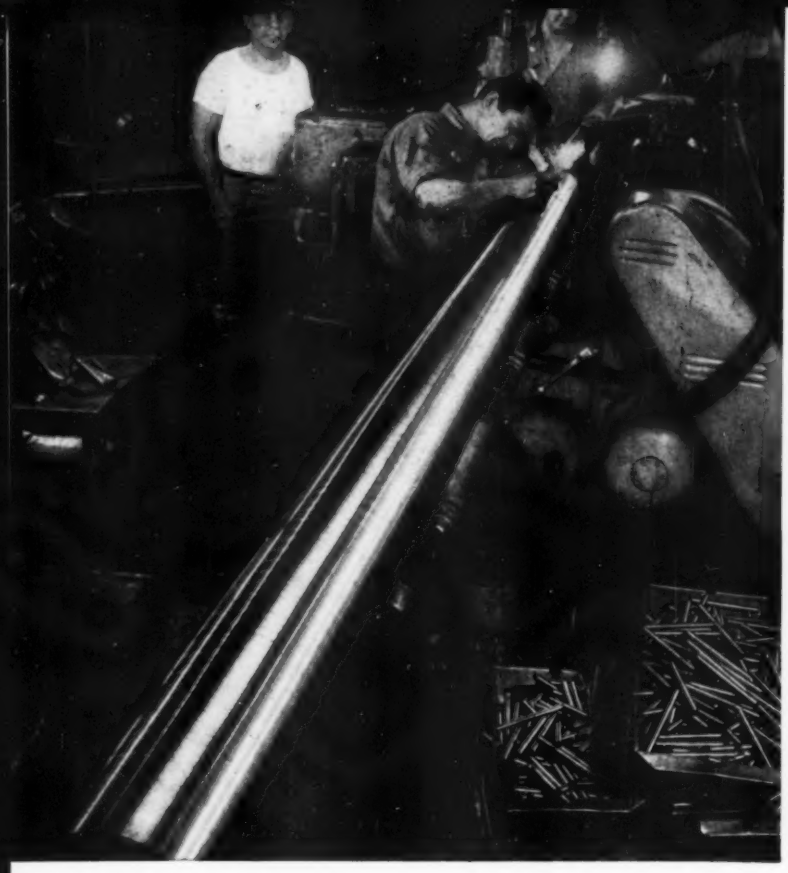
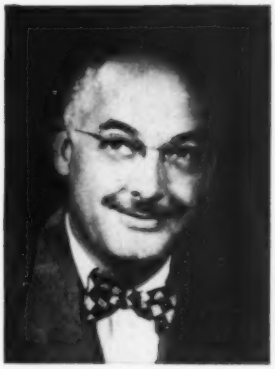


# What's YOUR problem?



**P. E. Stratton,** lubrication specialist in Standard Oil's Detroit office, gave the expert advice that solved a big problem for this midwest grinding company.

Whatever problems you may face in your plant, Standard Oil has a corps of lubrication specialists located throughout the Midwest ready to help you solve them. One of these men is near your plant. His wide experience and special training in the use of modern lubricants and cutting fluids will help you make real savings.

Why not arrange for his visit today by contacting the nearest Standard Oil (Indiana) office? And ask him about the advantages of . . .

**STANICUT Cutting Oils**—These special-duty cutting oils meet today's most exacting requirements and highest production schedules. Grades varying in viscosity and compounding are available, each containing the correct proportions of extreme-pressure and friction-reducing ingredients.

**STANOSTAMP Compounds**—Here are three established products for stamping or heavy drawing operations on either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications.

STANOSTAMPS offer maximum protection for dies and work, can be readily removed in conventional washing equipment.

**SUPERLA Quenching Oil**—From Standard Oil's complete line of quenching oils, this product is recommended for quenching work in systems where cooling facilities are limited and bath temperatures are high. It is a medium-bodied oil of red color. It provides efficient quenching of large forgings.

# Fills tall order on big grinding job . . .

**SUPERLA**
REG. U. S. PAT. OFF.
**Soluble Oil**

The men of a midwest grinding company had a big job on their hands and an almost equal amount of trouble!

The job called for one-pass grinding of hard metal rolls 33 feet long and 10½ inches in diameter, with the diameter held to a tolerance of 0.0002 of an inch. Wheel loading and feed-wheel glazing made it difficult to hold the size. Check marks and rusting of the rolls added to the troubles.

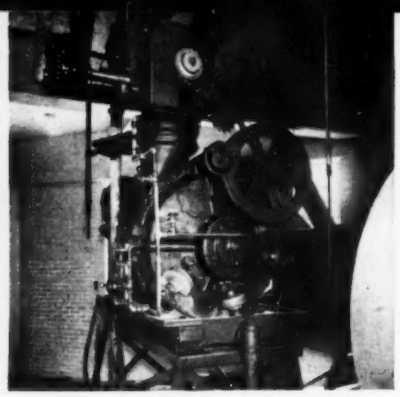
Operators took the advice of a Standard Oil lubrication specialist and switched the operation from the conventional coolant being used to SUPERLA Soluble Oil. As a result, wheels stayed clean, and the size was held with little trouble. The desired finish was obtained on the rolls. Rust ceased to be a problem.

SUPERLA Soluble Oil can do a superior job in your plant . . . not only on grinding jobs but on a variety of machining operations. It provides excellent tool life and finish as well as superior rust prevention.

To get help with your cutting-oil problems, obtain the services of the Standard Oil lubrication specialist located near your plant. A phone call to your local Standard Oil office will bring him to your plant. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

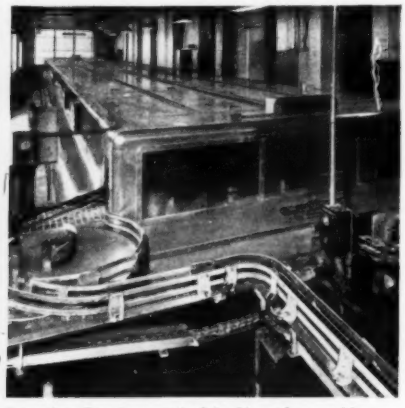
**STANDARD OIL COMPANY (INDIANA)** STANDARD

*Keg scrubber* – A constant stream of water at 130° F plays over these barrels and reaches bearings on conveyor.



*Wet-grain press*–After being heated to 180° F., grain is then pressed dry. Hot water comes in contact with bearings.

*Bottle soaker and washer* – Bottles are first cleaned with strong alkali at 180° F., then washed with water. These conditions make bearing lubrication difficult.



*Pasteurizer*–Beer is pasteurized in this modern machine which is subjected to constant water spray ranging from 80° F to 140° F.

# No trouble brewing for bearings!

A midwest brewing plant employed seven different greases in a variety of applications. Despite the use of these special products, the operators experienced difficulty. The greases would not withstand both water and high temperatures. Frequent applications were necessary.

A Standard Oil lubrication specialist was called in on this problem. Upon his recommendation, STANOLITH Grease–a lithium-soap product with the ability to withstand both heat and water–was given the job.

As a result, STANOLITH has replaced all seven greases formerly used and *has done a better job in each type of application.* Through its use over a two-year period, grease consumption has been reduced 20% and time spent in applying grease cut 50%.

STANOLITH Grease can prove its remarkable versatility in your plant, too. Its high mechanical and chemical stability plus its extreme resistance to heat and water qualifies it to replace a variety of special greases.

**STANOLITH**
TRADE MARK
**Greases**

To obtain maximum benefits from STANOLITH, use the services of a Standard Oil lubrication specialist. His headquarters are near your plant. How you can benefit by his on-the-spot service is explained at the right.

Standard Oil Company, 910 South Michigan, Chicago 80, Illinois.

# What's YOUR problem?

**Mr. D. V. Wills** of Standard Oil's South Bend office is the lubrication specialist who helped this Midwest brewing company solve a difficult lubrication problem.

He is one of many Standard Oil specialists located throughout the Midwest. These men have the practical experience and special training to handle lubrication problems on any type of operation.

Take advantage of the service offered by the lubrication specialist nearest your plant. You can reach him by phoning your local Standard Oil Company (Indiana) office. Why not call, today, and arrange to discuss with him the advantages offered you by STANOLITH and other outstanding products such as:

**STANOIL Industrial Oils** – This general-purpose line of oils provides cleaner operation of hydraulic units and supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

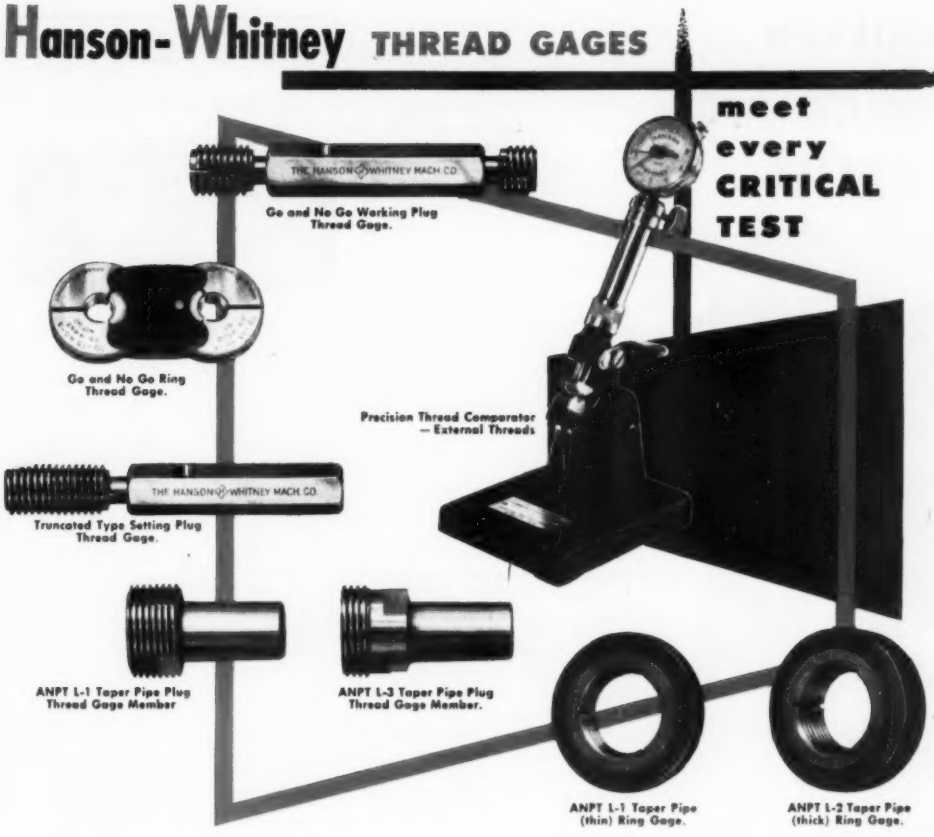
**SUPERLA Greases** – Available in a wide range of consistency grades and in both lime-soap and soda-soap types, SUPERLA Greases cover a wide range of applications. These efficient products are comparable in quality with the highest type of special greases.

**STANORUST Rust Preventives** – The eight grades of STANORUSTS form one of the most complete and effective lines of rust preventives on the market today. Each has been scientifically developed for its intended use. The grades range from a fingerprint remover to a heavy petrolatum that protects against corrosion for years under the most severe outdoor exposure.

STANDARD **STANDARD OIL COMPANY (INDIANA)**

# Hanson-Whitney THREAD GAGES

meet every CRITICAL TEST


THE HANSON-WHITNEY MACH. CO.
Go and No Go Working Plug Thread Gage.
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Truncated Type Setting Plug Thread Gage.
ANPT L-1 Taper Pipe Plug Thread Gage Member
ANPT L-3 Taper Pipe Plug Thread Gage Member.
ANPT L-1 Taper Pipe (thin) Ring Gage.
ANPT L-2 Taper Pipe (thick) Ring Gage.

The defense program, now spiraling, is going to wear out thousands of gages — especially those of sub-standard quality.

To insure continual close tolerance production, and longer gage life, specify Hanson-Whitney Gages—manufactured of the best materials to exacting Federal Government Standards, subjected before shipment to a battery of rigid Hanson-Whitney tests.

The H-W gage group illustrated provides you with a complete inspection gaging set-up for practically any thread regardless of form, pitch, or major diameter.

If your prints call for special design thread gages and gaging techniques, feel free to call upon our Engineering Staff for counsel . . . for this service has always been an integral part of our "Production Insurance" program.

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Chicago Internal Grinding Wheels produce better finishes with no sacrifice of wheel life or cutting action. They're your best buy because — they're "tailor made" to your particular specifications and on their way to you within hours after you order.

Better Wheels . . . Faster

Chicago Wheel's advanced production technique assures you perfectly balanced Internal Grinding Wheels to meet today's rigid finishing requirements. Faster deliveries, too . . . and for special jobs, overnight service is available.

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when there is a labor shortage. Every business enterprise must have men to work and produce that they should be able to have their merchandise to sell. Give them inducements so that it will pay them to stay. Treat them as men, or as you would want to be treated yourself. Then if a man works in a nice place under nice working conditions and has job security and good pay and can look forward to advancement, you will not be able to drag him away from his job.

It is still a good idea to have men trained to do more than one job in your place so that you can replace a man when you need him, when a man is out sick or on a vacation—not to train them at the time you need them.

Michael Axler
*New York*

•

## SKILL STEALER

I HAVE known several instances in the past where the scales were tipped in an applicant's favor for a superintendent's job solely because he guaranteed to bring along with him, or within a very short time, several crackerjack men that his new employer badly needed, who were working under his supervision at the concern he was leaving.

I was a supervisor in one large plant when a new superintendent was brought from a town 150 miles away. He was an outstanding executive. In a few months six of our foremen were laid off and replaced by foremen from the concern that the new superintendent came from.

There is another point of view. We are not informed as to whether those men got higher wages, better conditions or prospect of advancement by leaving Harrison to go to work for Ralls at the Gibbon plant. Most supervisors would, when they found himself losing men that had been working under them for some time, try and find out why were they leaving. Then if they were going to get more money, better conditions, etc., and if he was of the opinion that they were worth keeping he could probably have been able to offer them sufficient inducement to stay on.

But even this method has its drawback. I have known similar instances where men have been induced to stay on after they had informed their Boss they were leaving, by the promise of more money. It gave some of them a swelled head and an independent air. So that I believe from experience that no matter how badly

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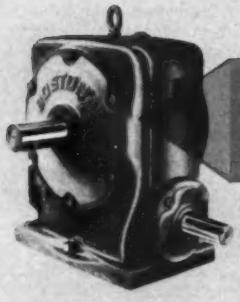
BOSTON Gear
STOCKS ARE Near

# HOW BOSTON Gear



## HIDDEN QUALITY SAVES YOU HIDDEN EXPENSE

BOSTON REDUCTOR

BOSTON RATIOMOTOR

To the naked eye, one power transmission unit may look just like another — so why not buy the one that costs a bit less? The answer, as many have learned from bitter experience, is that the difference in operating and replacement cost (the unforeseen or "hidden" expense) far exceeds the difference in purchase price.

### Take the Case of the Production Welding Machine

A large unit was designed around a low priced speed reducer that gave out in a few weeks and had to be replaced by a BOSTON Reductor. Here is the cost picture:

| | |
|---|---|
| Net difference in first cost | + $ 10.50 |
| Cost of repairing machine and replacing gear unit (2 men, 5 hrs. @ $3.00 per hr.) | — 30.00 |
| Loss of production (5 hrs., 12 parts per hr. @ $24.00 per part) | — 1,440.00 |
| NET LOSS | $1,459.50 |

### Take the Case of the Baking Oven

A cut price enclosed speed reducer failed and was replaced by a BOSTON Ratiomotor.

| | |
|---|---|
| Net difference in cost | + $ 10.40 |
| Cost of overhauling oven and installing new unit (2 men, 4 hrs. @ $3.00 per hr.) | — 24.00 |
| An entire batch of pastry worth $20.00 was lost due to drive breakdown. This, plus production loss (6 hrs., 12 batches per hour @ $20.00 per batch) made a total loss of | — 960.00 |
| NET LOSS | $993.60 |

The *hidden quality* in BOSTON Reductors and Ratiomotors is very real, even if you don't detect it at first glance. It is the result of BOSTON *Gear's* strict materials control, master craftsmanship and rigid inspection system. This *hidden quality* plus the unequalled convenience and service obtainable from Authorized Boston Gear Distributors (*see adjacent list*) makes it true and lasting economy to:

*Specify Standardized*
*Boston Reductors and Ratiomotors*
*Design Them Into Your Equipment*
*Get Them From Nearby Stock*

Write for Catalog No. 55 It contains a wealth of useful data and selection charts

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Bost-Bronz | Couplings | Universal Joints | Pillow Blocks | Sprockets and Chains | Bearings | Worm Gears | Helical Gears | Bevel Gears | Spur Gears

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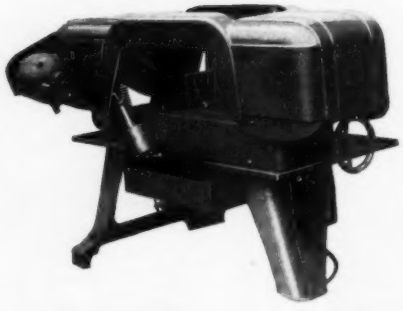

Model J, pictured, 10" x 18" Capacity, available as a wet or dry cutting machine. Also Junior Model B, (with or without casters) 5" x 10" Capacity.

# JOHNSON METAL CUT-OFF BAND SAWS

**lead the way in the metal-cutting field. They last indefinitely and deliver the most in time-saving, accuracy and efficiency. They are adaptable to any cutting job. Quick change from light to heavy stock requires only a minute.**

**They give —**

## Constant, Dependable Service

**Because — we use only known high standard parts, coupled with close-tolerance machining.**

***There Is a Dealer Near You***

**JOHNSON MANUFACTURING CORP.**
ALBION, MICHIGAN


you would have a man stay with you, it is better to let him go. It is beneficial to both man and foreman. You know there is no such thing today as the indispensable man.

In some districts employers have an agreement not to employ each other's employees unless the applicant for a job has already been separated from his employment.

I have seen quite a few instances like the problem Ralls has where a gang of men has left to go to work for some other concern where the grass looked a lot greener and the news got back to their old shop that they were getting much higher wages, better conditions, etc. In fact, they didn't know why they had stayed with the old shop for such a long time, and then in a few months one or two of them are doing their utmost to get back their old job and if they do it isn't long before most of those that left are back and glad to be back, having found out it wasn't such a bad place to work after all.

There are supervisors who would consider themselves smart if they were in George Ralls' shoes providing that he was guilty of enticing the fellows away from Harrison. But there is also another side of the picture. Such a procedure works out excellently for a while but the men whom you have been instrumental in getting to come to work for you often become the worst type of nuisance. They often get swelled heads and put on airs and expect to be treated as somebody special and often regard their George Ralls as a pal rather than their foreman and take advantage of the fact he brought them there and it places their foreman in an unenviable position.

*"Let me alone when you think I've got the knack of it, eh?*

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in a complete range of types and sizes carried in stock to simplify your tooling job.

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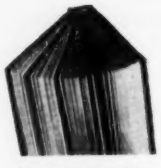

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—use the statistical quality control techniques explained in this book. Shows how to use the Shewhart control chart to reduce spoilage and rework . . . to get better coordination in design, production and inspection.

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Send me Grant's Statistical Quality Control for 10 days' examination on approval. In 10 days I will remit $5.50, plus few cents for delivery or return book. (We pay for delivery if you remit with this coupon; same return privilege.)

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Offer applies to U.S. only.


I believe from experience that it is bad policy on a foreman's part to try to get any man to stay who states he is leaving. Wish him luck and let it go at that.

Arthur Silvester
*Niantic, Conn.*

•

### SORCERER'S APPRENTICES

"CAN SMALL and medium-size shops afford to establish formal apprentice programs?" Whether they be small or medium size, if they employ apprentices they certainly cannot afford to do *nothing* about their training. This does not mean, however, that to successfully do *something* about the lads' training they must copy the elaborate schemes favored by large and wealthy concerns. Very few of the smaller firms would care to face the expense involved and indeed, there is no good reason why they should. To those of us with many years' experience of training apprentices, events have shown that excellent results can be achieved in smaller works at a very moderate cost. The reason for this is comparatively simple.

In large establishments, control is less intimate, the personal touch tends to operate in inverse ratio to the number of employees on the payroll and as a consequence, the big shops always seem to have more executives per hundred operatives than the smaller ones. In the large companies with their thousands of skilled workers and, possibly, hundreds of apprentices, the training systems incline to become top heavy. The amount of clerical work involved in keeping comprehensive records, too seldom consulted or made use of, is usually out of all proportion to the benefits derived by the employer or the lads.

For the practical or shop training in smaller shops the "old-timer-to-student" basis is almost ideal. It is thorough, homely and inexpensive, without frills but full of starch. With probably not more than a dozen apprentices to train, a good shop foreman can give them individual attention in the matter of advancement and in assessing their ability to absorb practical instruction, while at the same time noting what use they make in the shops of their technical knowledge. "Old Timers" would, of course, be responsible for imparting the actual methods of practical execution, and it is thus quite possible to be thorough about the training while keeping the cost to a minimum.

The problem of skilled manpower shortage bears heavily on the engineering industry today and it is

# ARE YOU SEARCHING FOR THE ANSWER?

U. S. DEPARTMENT OF COMMERCE
NATIONAL PRODUCTION AUTHORITY

E 32A—NATIONAL DEFENSE.
APPENDIX

pter I—National Production Authority, Department of Commerce

[NPA Order M-30]

PART [illegible]—ALLOCATION OF TUNGSTEN

This order is found necessary and appropriate to promote the national defense and is issued pursuant to the authority of section 101 of the Defense Production Act of 1950.

In the formulation of this order, there has been consultation with industry representatives, and consideration has been given to their recommendations. However, consultation with representatives of all trades and industries affected in advance of the issuance of this order has been rendered [illegible]

chapter (NPA Regulation 2) cont[illegible] to apply to tungsten, but deliveri[illegible] on any [illegible] may be made [illegible] allotment [illegible] NPA, except as otherwis[illegible] provided in this part. The NPA may, from time to time, issue directives as to [illegible] tungsten and, [illegible] herein, such [illegible] over the provisions of this part.

§ 34.3 *Definitions.* As used in this part:

(a) "Person" means any individual, corporation, partnership, association, or any other organized group of persons and includes any agency of the United States or any other government

(b) "Manufacture" means to melt, alloy, mix, fabricate or process in any other [illegible] consume or otherwise employ [illegible] the co[illegible]

**M–30**
JAN. 22, 1951

of Class B high speed steel (12 percent or more tungsten content).

(c) Effective March 1, 1951, no person shall receive, from individual and from all sources, in any one month, more than 20 percent of his total requirements of high speed steel containing tungsten in the form of Class B high speed steel (12 percent or more tungsten content).

(d) Effective March 1, 1951, no person shall place orders for or shall accept delivery of high speed steels containing tungsten except for actual use: *Provided, however,* That this prohibition shall not apply to [illegible] and to steel distributors, [illegible] place their orders [illegible] ...ft to ...in this ...who ...Class ...during any

(e) The [illegible] section shall not apply to [illegible] use not in excess of 500 pounds [illegible] ...ed steel (12 percent [illegible] ...nt)

## *Here's the Answer...*

**For "at least 80% of your high speed steel requirements", Firth Sterling offers these fine quality steels:**

**Circle-M Super High Speed Steel** — the PREMIER Moly-Cobalt high speed steel (Type M-36). This steel can be used at 20-25% higher speeds than used for ordinary high speed steels. Circle-M has a good red-hardness value and is highly abrasion-resistant. Write for Bulletin SL-2082.

**Star-Mo M-2**—an improved 6-6-2 tungsten-molybdenum type of high speed steel developed for general use on machining operations. Write for Bulletin SL-2015.

**Hi-Mo High Speed Steel**—the standard 8-4-2 moly-chrome-tungsten type that has the combined features of excellent toughness and low hardening heats.

**M**
CIRCLE M

*Memo*

**TO**---Users of High Speed steel
**SUBJECT**---Experience with Moly Steel

Firth Sterling has been known for years as a leading producer of the tungsten types of high speed steels. The tungsten steels Circle-C and Blue Chip are world famous and Firthite, sintered tungsten carbide, is used in metal working shops everywhere...

**BUT** ... 47% of Firth Sterling's 1950 production (a record peacetime year) consisted of Moly-type steel.

R227

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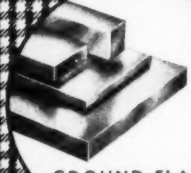
HACK SAWS

BAND SAWS



GROUND FLAT STOCK

AMERICAN SAW
& MFG. COMPANY
SPRINGFIELD 1, MASS.
The Tools in the Plaid Box"

imperative that full provision should now be made for future needs. The ideal arrangement would be for each establishment to rear a number of skilled men equal to the known losses from retirement and death. Recent investigation shows this figure to be around 5% per annum. The great majority of shops could train five apprentices to every hundred skilled men and if called on, many could double that figure without endangering the quality of the instruction. On the 5% reckoning and assuming a five years' apprenticeship, a shop employing 200 skilled men would carry ten apprentices, this would call for an intake of two per year, one each six months. Starting from scratch, the plan would take five years to mature, when the shop would have two first, second, third, fourth and fifth year apprentices, one in each year senior by six months to his year colleague. The good shop foreman would find no difficulty in mapping out the steps by which those lads should move in the matter of quality of work entrusted to them.

The evening class method of instruction in technical subjects has, in the past, produced many first class engineers who have left their mark on the industry and many more who, in less spectacular fashion were and are today, the backbone of it. It is a time saver and gives the younger generation something really useful with which to occupy its leisure hours, as an antidote for picturitis and the ballroom floor fever, it has everything to commend it. Large, wealthy companies with, in many cases, monopoly markets, can afford to be more or less indifferent to the cost of training their future skilled men and are apt to coddle and pamper their lads during the training period. This is a mistake and does more harm than good. Lads so trained are inclined to lack initiative and resource.

C. D. MacKinnon
*Airdrie, Scotland*

•

GOOD PLANT operation makes it necessary that there must be able workers behind an able foreman. It is to insure the continuation of this desirable condition in industry that modern apprenticeship training is necessary. Future needs for able and trained workers will not be met when the march of time removes the present skilled workers, if there is no planned apprentice training program.

Both large and small plants share the responsibility for assuring the continued growth of a skilled and

A CLEVELAND TAPPER set up on a munitions job, tapping a 1 15/32", 16-pitch Buttress thread in SAE 4143 steel tubing hardened to 35 to 37 Rockwell.

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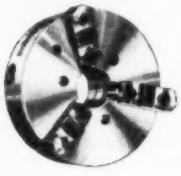

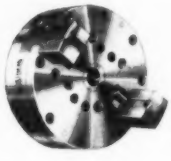

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Once again, as metal working industries pick up the load on military production, most orders for chucks are coming through stamped "urgently needed" . . . while practical delivery dates extend further and further ahead.

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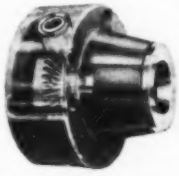

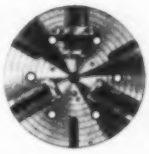

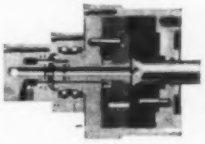

AIR OPERATED

# CUSHMAN CHUCKS

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efficiently trained working force. Even the small and medium-sized shops cannot afford to by-pass the establishment of a formal apprentice program

Apprentice training must be planned. It cannot be done well on an informal old-timer-to-student basis. Journeymen are usually unwilling to sacrifice earnings and devote their time to training apprentices. Often, those who do act as instructors may be excellent journeymen but poor teachers, so that the time of the apprentices may be inefficiently utilized under their direction.

An effective apprenticeship system requires more than having the apprentice acquire familiarity and skill in the use of the usual tools of the craft. It also embraces knowledge of mathematics of the trade and the ability to read and interpret blueprints and specifications. Formal apprenticeship covers the application of trade knowledge and skill on the actual job, where the apprentice is checked and supervised. Adequate rates of pay and periodic promotions are part of a formal workable apprenticeship system.

In some crafts, the apprenticeship systems have been allowed to degenerate. They have not been adopted to changing needs of modern production. Responsibility for these deficiencies cannot be charged simply to management or labor. They are jointly responsible for the situation. The deficiencies of the system are obvious to any critical student.

In many cases, apprenticeship has been used not to train new workers, but to restrict entrances to the trade. The result is accomplished by setting

*"What do you know—you made the same mistake I made when I started here! I guess the only fair thing is to give you the same hell my boss gave me."*

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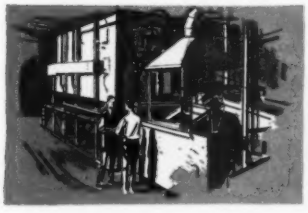

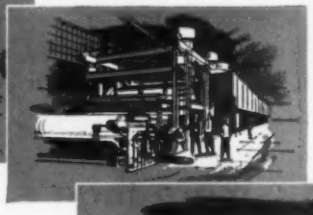

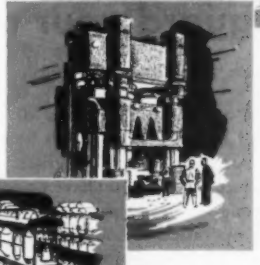

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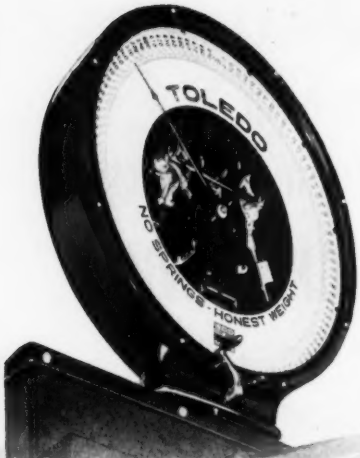


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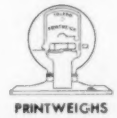

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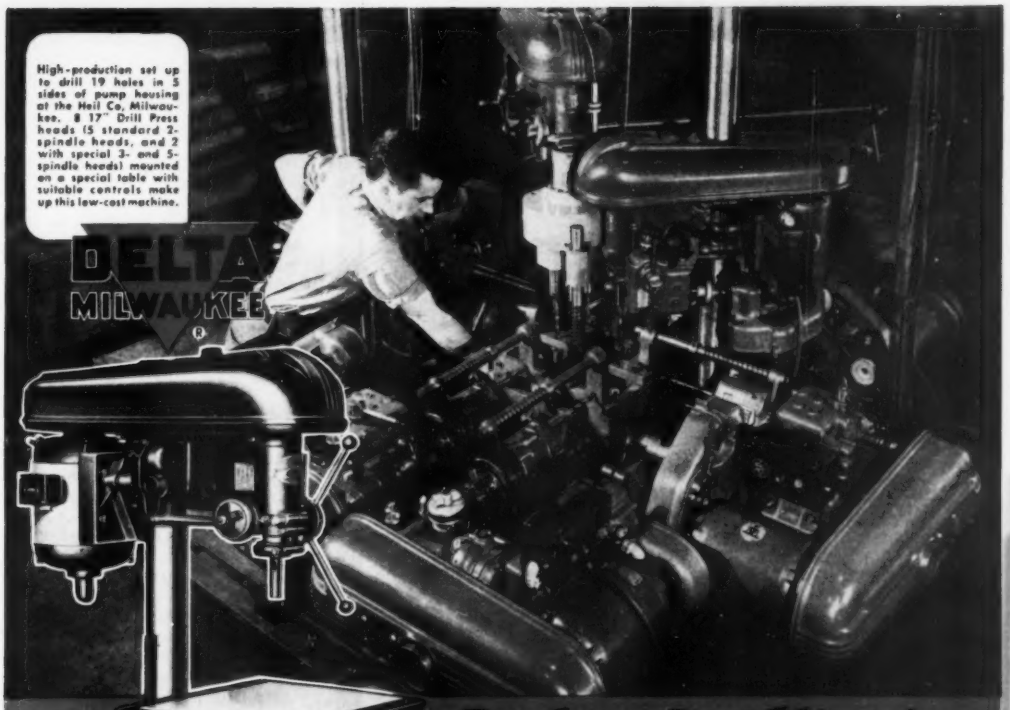
requirements at such a high level that interested young people are discouraged from entering, or by specifying that the ratio of apprentices to journeymen shall be maintained at low levels. Frequently, employers have been unwilling to clutter up their shops with substandard workers.

Labor has zealously guarded its right to regulate the terms of apprenticeship, although there is serious question as to the necessity for such long periods as have been specified in some trades. Certainly the specification of arbitrary periods of apprenticeship takes no account of individual differences in learning and, in itself, offers no incentive for unusual application on the part of the apprentice. As a result of these conditions, some apprenticeship systems have not met the needs of the modern economy.

However, a number of large industrial firms have established carefully planned apprenticeship training programs in recent years. These programs could be adapted in lesser degree to the needs of the medium-sized and small plants. Provisions of the program specify a wide range of training and prevent the retention of the apprentice on any one machine simply because he shows proficiency there. Regular advances in wage rates are provided, and a bonus is payable on graduation from the course. In addition, piece rates are so arranged that the apprentice may earn more than his guaranteed wage if he shows unusual ability at any time throughout the period.

It has been said that "the best carpenters make the fewest chips." The apprentice should certainly not

*"Be-yoo-tiful! Where'd he get the diamond —off the tip of one of his tools?"*


High-production set up to drill 19 holes in 5 sides of pump housing at the Heil Co, Milwaukee. 8 17" Drill Press heads (5 standard 2-spindle heads, and 2 with special 3- and 5-spindle heads) mounted on a special table with suitable controls make up this low-cost machine.
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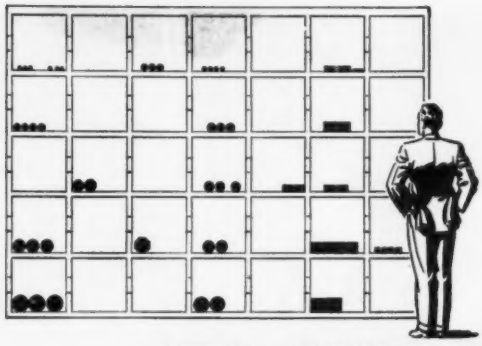

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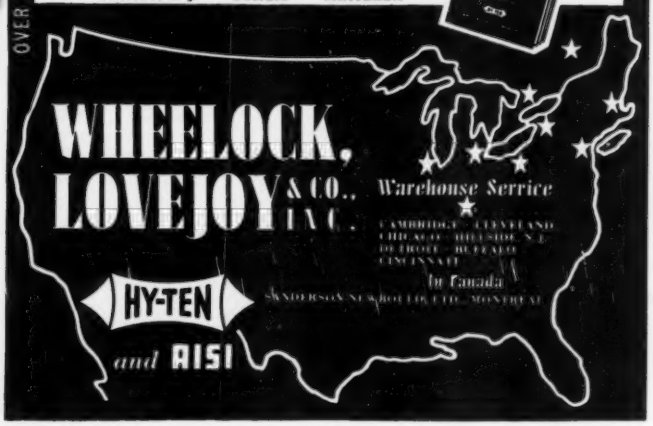


be expected to make the fewest chips. But some foremen expect that very condition. They also claim that apprentices ruin work and interfere with good production records. However, under a plant-wide planned apprentice training system that schedules all apprentice work and assigns definite qualified instructors, efficient apprentice training could be assured.

A well-planned apprentice-training program suited to the needs of the size of the plant will assure competent and trained workers for replacements and additions to the working force.

Harry Kaufman
*Philadelphia*

•

## WHAT'S NEXT BOARD

REACTIONS to ways of handling the scheduling of work in a shop seems to vary from plant to plant and location to location. The use of a method similar to that suggested of posting work against men and machines has been successful in some instances.

In one small machine shop in the Midwest the workers preferred to know how much work was available. This, in a sense, was the basis of their working speed. Should the work become low and the repair jobs scattered then the boys began to slow down on their jobs. This was self-protection and something we all do. It perhaps is not to be approved, but nevertheless it does happen.

A company must realize this and plan in advance its work (if possible) to always keep its workers at ease in their minds about the volume of work. Nothing can be more upsetting to employees than to learn that the business is slow and that maybe there will have to be a layoff. We are all human and we like to know about our future and how it is going to affect our work.

Then, too, men frequently feel that a schedule board is a work pusher. It is true that some people do not like to work under pressure. They prefer the happy-go-lucky type of existence. To know that more work is waiting for them is an unpleasant influence in their thinking and they do not do their best on the job.

In these cases the board is a failure and causes more trouble than it is worth. However, a good foreman knows his men and can overcome these instances by proper and careful handling. He can solve the problem by not setting up man schedules but rather by the establishing of machine schedules. The use of men's names and the jobs they will do is

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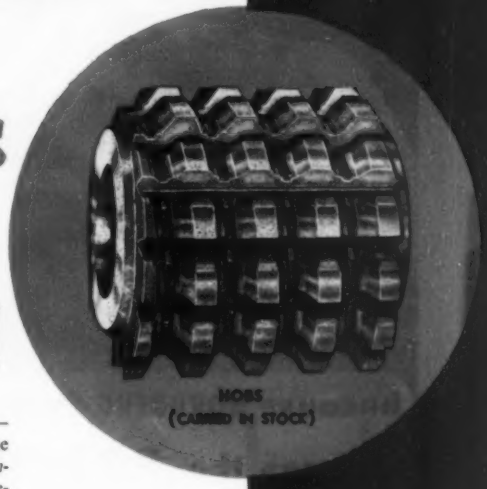


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not flexible enough in most cases. One never knows exactly how a job is going to go, whether there will be delays and if some part may be spoiled. If the work is scheduled by men, the taking away of some job from one person and giving it to another often causes dissatisfaction in the shop. It sets up jealousies which can bring the roof down around the foreman's head.

The most logical and workable way is to post jobs, schedule machines and then pick your men as they finish their work for the next critical job. Often job listings must be shifted. What is critical today may not be tomorrow if some more urgent work comes in. With a man work schedule it would be difficult to shift things around. People do not like changes, particulary if they have made plans on how they are going to do the work. It upsets routine thinking and that is something that it is not advisable to do with the general average of people.

Perhaps the most sound advice would be not to schedule the work by men. But rather to set up the list of work and if possible list it in order of importance. If it lends itself to machine scheduling, do this in as general way as possible. Do not pinpoint. If the work is to be done on a milling machine, list it as milling machine but do not list as an individual machine if there is more than one milling machine in the shop. In other words, don't give your men a chance to feel that you are scheduling them as individuals. Merely let them realize that there is a backlog of work and they can then work their steady pace without fear of a layoff.

The idea is sound and is used with success. The foreman is the key to its successful operation. He must know his men and must handle the problem as it occurs in that specific shop.

Charles D. Townsend
*West Hartford, Conn.*

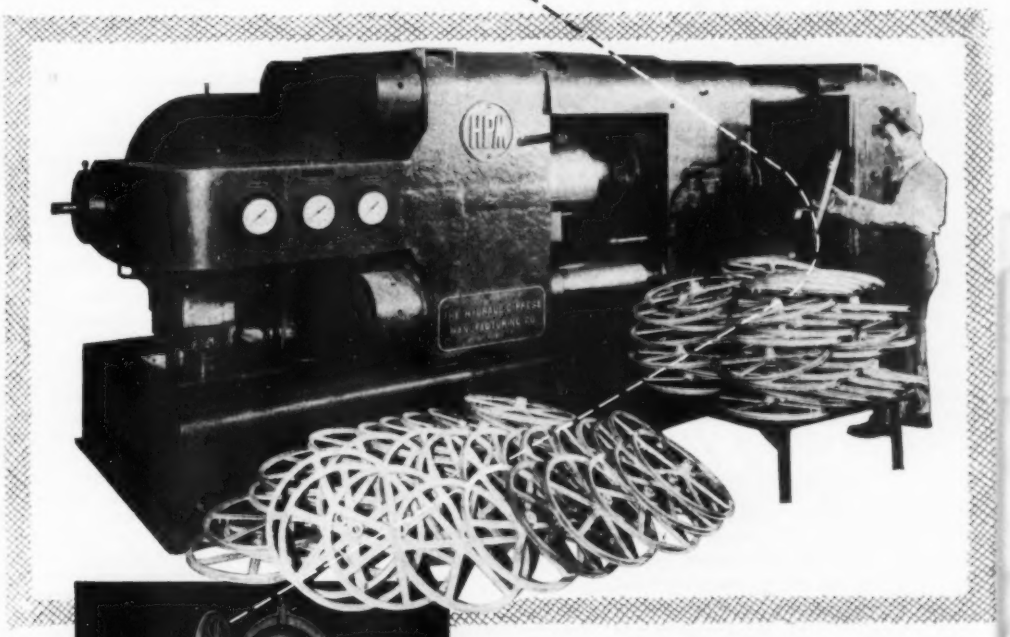
•

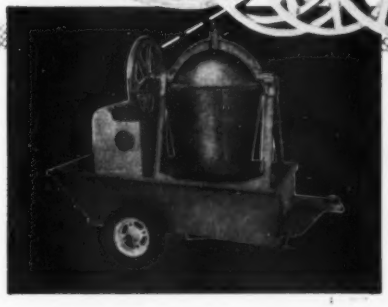
WHEN A change of procedure in the shop is suggested, however good it may turn out to be there is nearly always someone who is opposed to it.

Of course such a method is used to avoid delays and get out more work during the day working hours and should be an ultimate gain for both employer and employee as well.

A competent foreman plans the routine of work for his help as far ahead as he is informed of its type, either in his mind or perhaps on private notes on a sheet or book

# CUT PARTS COSTS WITH H-P-M DIE-CASTING MACHINES...





● Illustrated above is the die cast pulley wheel employed by Wright Engineering and Supply Company of Denver for a light weight portable mixer. Increased production and improved product quality has been Wright's experience since they installed this large H-P-M Die Casting Machine . . . and reaped the benefits that such H-P-M users as Hoover, General Electric, Westinghouse, Chrysler and many others enjoy.

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BUT HE KNOWS TH' VALUE OF SAFETY! DIDN'T HE SEND FOR TH' SAMPLE OF SOL-SPEEDI-DRI?
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whichever may seem easiest to serve as a jog to his memory. But plan ahead he must, to be ready to make an immediate change that may be made necessary by a cancellation or change of order, a breakdown of equipment, or the absence of a workman on account of sickness or other reasons.

This is done by the foreman so that an unforeseen stoppage of work may be made as short as possible. Improved machinery and the use of carbide cutting tools are for the same purpose.

A foreman's job demands much careful thought. The plan that helps him most is best for that individual as well as all concerned. Any change in the shop is made hoping to increase production or improve the product.

I would give the board plan the benefit of a doubt for general use. However, frequent changes on the board would tend to lower faith in the management.

Abel Blakeman
*Watervliet, N. Y.*

•

THE "WHAT'S NEXT" board is employed in many shops and can by no means be termed a work pusher. It does work as a stock control and automatically as a production control. When jobs are posted on a board we always know the position of that order in the department. It is also a big help in having work layed out for the machines in advance of breakdown or new setup.

The operator does not have to go looking for the foreman or for a new job. The employer likes to know what he is going to run next. It enables the employee and the foreman to have the proper tools and equipment ready for the next setup. The average employee likes to see plenty of work piled up for him. He only gets the impression he is running out of work when we fail to provide it in sufficient quantities.

I have often heard the workman say that the foreman wants production yet he has to continually wait for work. I have read somewhere that progress involves risks; you can't steal second base and keep your foot on first.

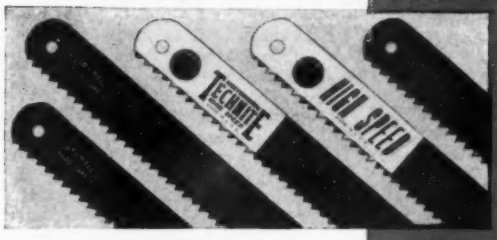
A. E. Salmons
*Philadelphia*

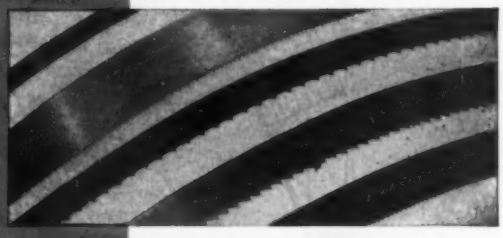
•

THE PROGRESSIVE foreman who takes the time to plan ahead believes in being one or two jumps ahead of situations before they arrive. The "What's Next" board is nothing more

1881 CAPEWELL

# MADE WELL TO CUT WELL



## HACKSAW BLADES

*Power blades:* HIGH SPEED, made of 18-4-1 tungsten high speed steel; TECHNITE, made of molybdenum high speed steel; SAFETECH, high speed blade, softer backing for safety, shatterproof.

*Hand blades:* HIGH SPEED, TECHNITE, FLEXTUNG, FLEXLOY, *and* HARDTUNG; these five types available in two lengths, and four different tooth counts, cover every requirement from skilled tool room work to home work shop.

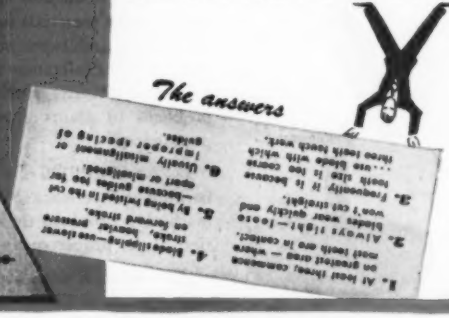
## BAND SAW BLADES

*Capewell Flexible Back Hard Tooth Band Saw* blades for metal cutting are made from carefully alloyed and processed tool steel and only the full tooth is hardened, giving a tough, flexible body complemented by sharp, precisely set and hardened teeth. They are available in Contour saws, Cut-off saws and Skip Tooth saws. *Capewell Spring Temper* band saws are made from a tough, resilient alloy steel suitably hardened throughout. Capewell narrow Wood Cutting Band Saw Blades have proper hardness for clean cutting, yet the flexibility to stand bends and strains.

*How's your* **S-I-Q?***

1. In power cutting with a hacksaw how many teeth should be in contact?
2. Should saw be tight or a little loose? (power cutting)
3. Why do hand hacksaw teeth break?
4. Why do hand hacksaw teeth get round?
5. Why do band saw blades break?
6. Why does a band saw sometimes cut crooked?

*(Saw Information Quotient)

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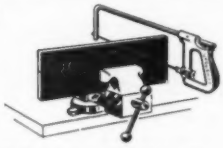
THE *new* 360° ALL PURPOSE SAW



"Dafiles" cut almost any material in any direction, fit Capewell or other standard hacksaw frames when used with Capewell Dafile-links; can be used for high speed cutting in power jig... ideal wherever you have a radius cutting problem, the need for sharp turns, or intricate patterns to cut.

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than a symbol of preparedness. It certainly looks to me as being a convenience in anticipating work assignments.

The "Board" is certainly an improvement over the old-fashioned method of letting a man know that he is to do a certain job after he gets through with the one he is working on. You know, the old-timer who delights in saying: "Now, Bill, here's a little job I want you to do, and when you get through with this I want you to—bla, bla, bla and so forth," until the individual almost feels that he is to be well supplied with jobs for life.

The purpose of the board is to assist the foreman in regulating his job placements. At the same time it has a psychological effect upon the worker in that it imbues him with a sense of steadiness. A man can appreciate a superior who is businesslike and surely no one can misinterpret the "Board" as being a means of crowding.

Let us get back to the old-timer and see what happens during his inefficient reign. A worker goes to him for a job. O.T. is busily occupied pawing through a stack of orders on his desk when his mechanic approaches him. "What'll I do next?" asks the worker. O.T. spins around a couple of times and then proceeds to scratch his bewildered head. "Let's see now!" he replies, increasing his tempo at the paper shuffling; "I've got a job here somewhere that'll just be up your alley." The patient worker stretches his neck in order to follow through the work orders. O.T. hesitates as he comes to one he thinks suitable. "Nope, I'm saving that one for Smith," he mumbles to himself

*"Well . . . all the same, I'd feel a lot safer if these things were on him."*

"YOU ARE KNOWN BY THE COMPANY YOU KEEP"

# Who's Who?

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Wood Screws, Machine Screws, Tapping Screws, Drive Screws, Special Screws. Aircraft Screws, Stove Bolts, Nuts (square, Hex, wing). TWINfast, Sems, Tap, Thredlock, Clutch Head, Lock-Tite, Spin-Lock, Taped Screws and many other types of fasteners. All head styles, Metals, Finishes.
**New 1951 Catalog now available.**

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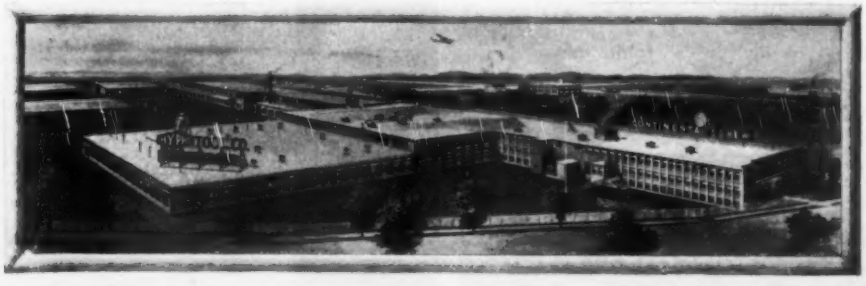

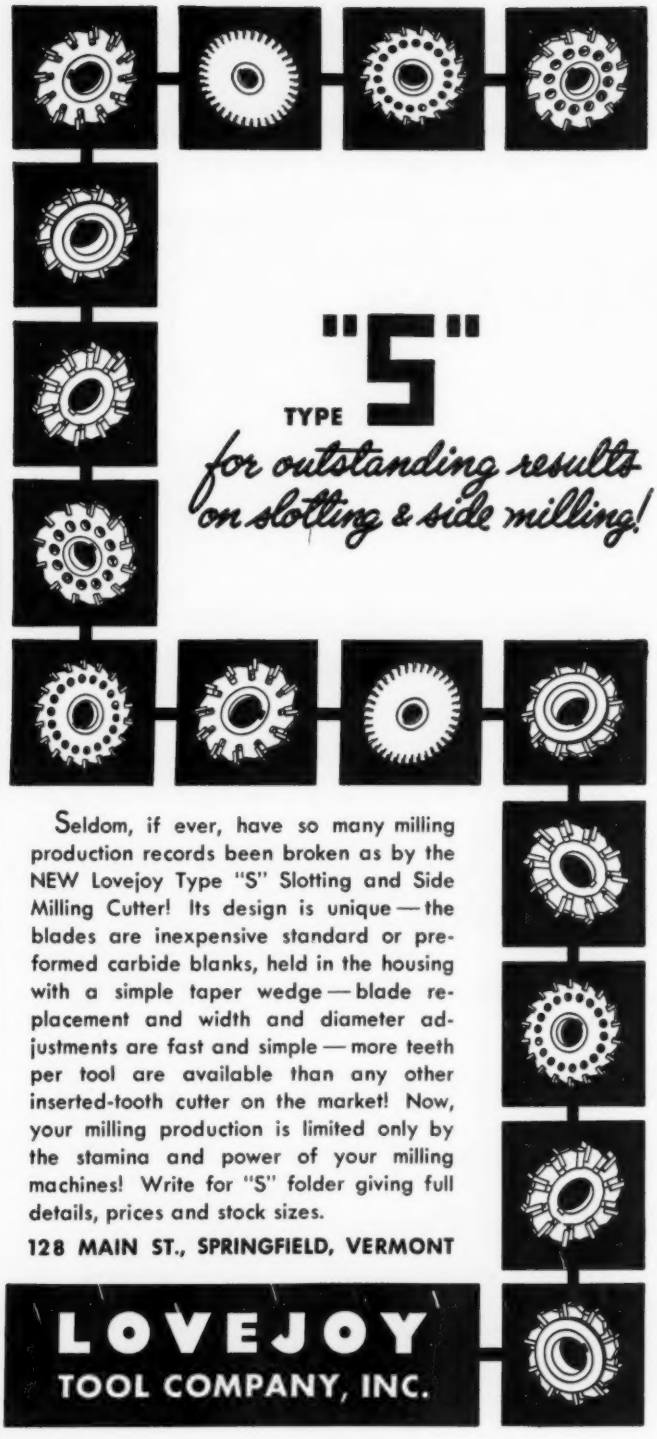
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TYPE
for outstanding results on slotting & side milling!
Seldom, if ever, have so many milling production records been broken as by the NEW Lovejoy Type "S" Slotting and Side Milling Cutter! Its design is unique — the blades are inexpensive standard or preformed carbide blanks, held in the housing with a simple taper wedge — blade replacement and width and diameter adjustments are fast and simple — more teeth per tool are available than any other inserted-tooth cutter on the market! Now, your milling production is limited only by the stamina and power of your milling machines! Write for "S" folder giving full details, prices and stock sizes.
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and thumbs through some more.

Finally the fellow leaves the O.T., after some preliminary instructions, and proceeds to tackle the new job. The poor guy studies over the drawing for a while and is just about to dig in when along comes the O.T. with another drawing. "Come to think of it, this job is wanted before that one; better hop onto this." Frustrated Frank is paid by the hour so doesn't concern himself much about the loss of time.

The modern leader takes time out at intervals to plan his jobs and itemizes them on the "board." He doesn't leave things to the last minute to decide—he weighs things. He knows his men and has a pretty good idea what type of work they can do. As far as the attitude of the men on the purpose of the board is concerned, they could be considered as being overly temperamental in the event of their objection to its use.

Jack Everett
*San Francisco*

•

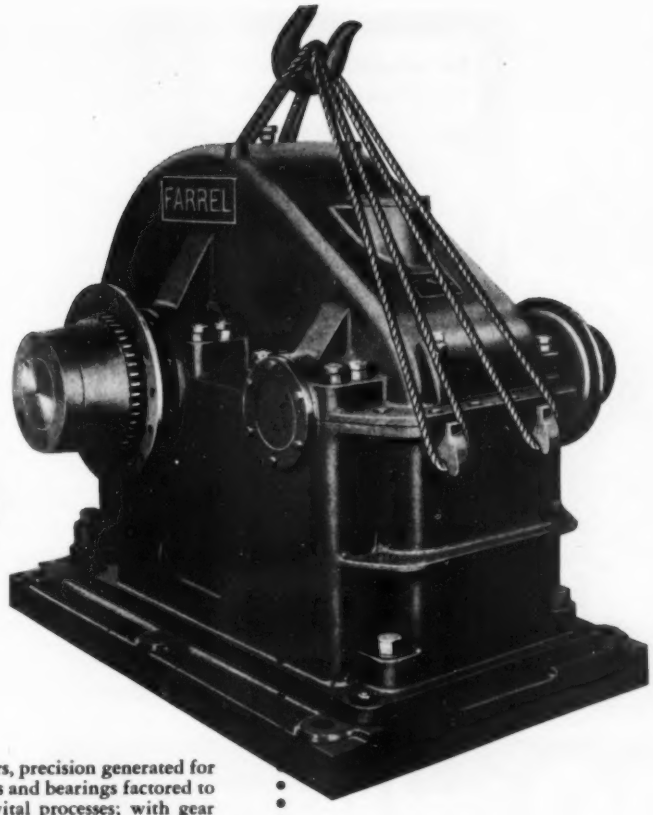
THOUGH IT be granted that initial reaction on the part of some men might be unfavorable regarding use of a board to schedule several jobs in advance for each machine, advantages will definitely outweigh drawbacks in a multitude of instances. The more the work in a given department or plant leans toward short-run jobs, the more advantageous such a board will be.

So far as a man objecting to any signment if and as production may have been preliminarily assigned to him, this is a matter that may be dealt with readily. In the case of any given machine, let ore or two jobs be scheduled ahead under the heading "Immediate." Then let a number of other jobs be scheduled below these, under the head "Tentative," and let it be understood from the first that jobs scheduled as tentative are subject to re-arrangement or to re-assignment if and as production re-require.

Al contends that opportunity given men to mull over given jobs somewhat in advance (and they will do some mulling even if they are scarcely conscious of it) and the attendant realization that there is no dange of working themselves out of a job, carries definite value production-wise. Further than this, a foreman can use a system of this kind for grouping jobs on a given machine where changing the setup from one job to another will involve the lowest consistent amount of setup time.

In the initial adoption of such a system, there will likely be need for

# FARREL® SPEED REDUCERS




THEY ARE MADE **with Farrel-Sykes gears, precision generated for smooth, quiet operation; with shafts and bearings factored to safeguard against interruption of vital processes; with gear cases proportioned to withstand repeated heavy peak loads. These are standard features of design, incorporated to assure long, trouble-free performance under normal operating conditions.**

FOR UNUSUALLY SEVERE SERVICE, THEY ARE MADE **with gears, shafts, bearings, and even some housing dimensions, proportioned to meet specific load, speed and operating conditions. Because of this flexibility in design, Farrel speed reducers have provided the solution to innumerable application problems.**

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Wittek Roll Feeds are made in standard models to meet every requirement in the automatic feeding of strip stock to punch presses or press brakes. The distinguishing feature is their simple and economical method of operation which does away with complicated parts thereby assuring *speed* and *accuracy* in the feeding of various kinds and thicknesses of material.

Wittek Adjustable Reel Stands are designed as companion units to Wittek Automatic Roll Feeds and are available in seven different models to handle *ALL* types of coiled strip stock and wire being fed to punch presses or similar production machinery.

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***They will mill keyseats:***

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- in offset holes.
- that are straight.
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- partly through holes.
- for interchangeable parts.
- without clamping the work.
- of standard width and depth.
- in holes that are closed at one end.
- where keyseating machine can't reach.

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complete, handy size


a nicely-balanced application of diplomacy and mild discipline such as must usually attend any new departure in practice. Employee energy may seem to dim temporarily, until the men involved gradually come to take the thing as a matter of course. Naturally, if the real purpose of the foreman is to actually drive his men, and the men know it, the board will meet with far greater resentment and consequent resistance than it will in a department where a foreman is known to be reasonable though firm.

In plants where there are certain operators particularly apt at fast and accurate setup, and others who are good men but not so fast in setting up, the shorter jobs would naturally be routed to the faster setup men as far as expedient, and use of a "what's next" board would be ideal from this standpoint.

Operators with a well-developed sense of profitable operation sequence might even be called upon to discuss the most profitable sequencing of jobs to be listed ahead, with their foremen, in certain cases. In some instances this would have a good psychological effect, but the foreman must be prepared in any such case to take all responsibility for any method actually adopted, or he will surely be accused of unloading his responsibility on his men.

If and when there is any serious question touching whether use of such a board would be profitable in a given plant or department, there is no reason why it cannot be tried out without irrevocably committing oneself to its continued use. In such a case, let it be known that it is being instituted on an experimental basis. If and when use of such a board is adopted as an experiment, however, be sure to keep it in use sufficiently long to obtain a true picture of its efficiency. Any new method inevitably undergoes an initial period of at least relative awkardness.

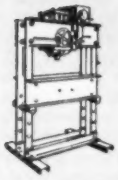
John E. Hyler
*Peoria, Ill.*

•

## "THEIRS NOT TO REASON WHY"

IN THE PAST, it often happened that when some bright boy made a suggestion to the boss for improving the method of doing some job, he was promptly informed that he was paid to work and not to think. But those days went out long ago and everybody in most plants is encouraged to send in suggestions that will save money, time and effort in the plant. In fact employers pay worthwhile

# Unusual machines for a wide variety of industrial applications



### 1. 150-Ton Electdraulic Press

Motor driven heavy duty hyraulic press; pre-set controlled tonnage; ram speed 12" down, 13" up per minute; ram travel 12"; bolster travel 28"; work can be fed from side or front; one operator can center work and control press.

### 2. Reamers, Dual Spiral

Dual spiral cutting action, one dual spiral reamer replaces five standard expansion reamers, straight or tapered shanks.

### 3. Die Sets

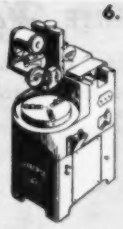
Features ball bearing bushing, long die life, perfect alignment, cleaner cutting.

### 4. Tool Post Grinders

Attachment for lathes, shapers, planers and millers; Applications: internal, external, face and taper grinding.

### 5. SSM Super Surface Grinder

Automatic Wet Surface Grinder with work capacity up to 62" long x 14" wide and 28" high. Revolving work table permits grinding successive surfaces without removing job from machine. Grinding wheel traverses automatically between stop limits. Four point precision level for setting up work.



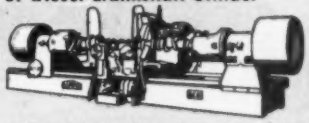
### 6. VAC Rotary Grinder and Vertical Lathe

Turns and grinds large work pieces of comparatively short length. Has 25" swing and can grind dies up to 18" x 18" square. Hand controlled vertical carriage travel, variable hydraulic, horizontal traverse of both cutter and grinding wheel.

### 7. Presses

For every purpose, sizes: 2-ton, 3-ton, 10-ton, 25-ton, 40-ton, 60-ton, and 150-ton, hand, hydraulic, air or motor driven.

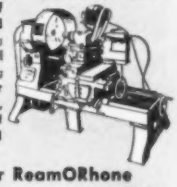
### 8. Diesel Crankshaft Grinder



Resizes and reconditions large railroad engine crankshafts up to 224 inches length, 40 inch swing; other models up to 382 inches length 60" swing. Also cylindrical grinding operations. All of the accuracy and features of the smaller world-famous Lempco automobile and truck crankshaft grinders.

### 9. HGX—Grinder—Lathe (Du-all)

Combines work of grinder, lathe and boring mill, 53" swing; automatic cross feeds! Hollow work spindle; face plate; grinds or turns large surfaces, internal and external tapers; small model ACX also available.



### 10. Speedmaster ReamORhone

Wet ream and wet hone on one machine, quickly interchangeable from reaming to honing.

### 11. Mobilcrane

Mobile shop crane eliminates need for overhead hoists and rails, capacity 2 tons, boom travel to 6'8" (Boom extension available).

### 12. Universal Cylindrical and Roll Grinder

The CRCG cylindrical grinder reduces grinding costs on large cylinders and rolls up to 12 ft. long and 29" diameter. Its price is substantially lower than standard machines of similar capacity. Reasonable delivery.

### 13. Disc Surface Grinder

Tilt-table, spring floated disc grinder with coupled air suction and waterfall grit remover. For flat grinding of castings or other metallic surfaces up to 19" wide.

## Rotary Grinder and Vertical Lathe

- ✓ Simultaneous Grinding and Turning
- ✓ Concentric Grooving
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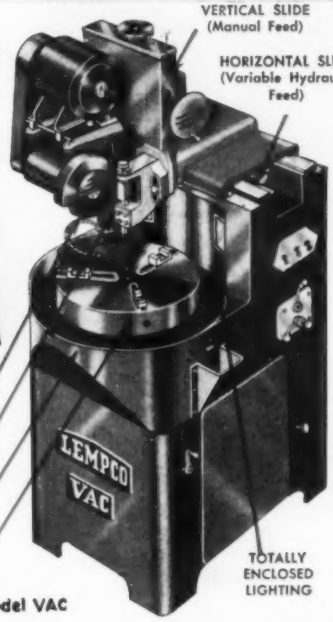
- ✓ Facing




**Model VAC**

**60 day delivery**

A surface grinder and vertical lathe for short work pieces of comparatively large diameter. Besides its use in sharpening dies it can turn short work pieces, cut and grind simultaneously or remove large quantities of metal on surfaces up to 18" x 18" square or 25" diameter that might ordinarily require a shaper, milling machine, or large swing horizontal lathe.

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Kindly send additional details on the following equipment or machines:

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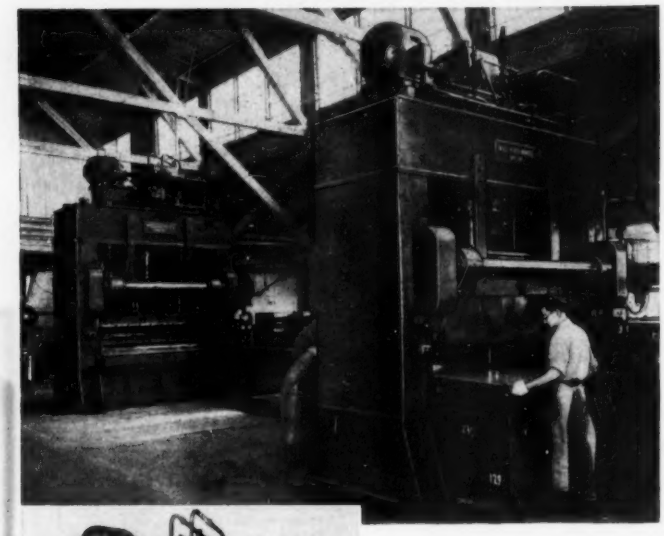
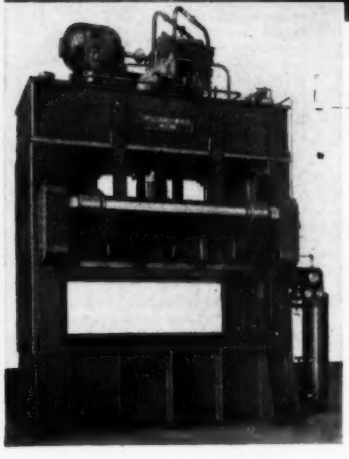
## WILLIAMS-WHITE *Hydraulic Press*

- **Capacity, 250 Tons, for efficient forming and blanking operations**





- **Area of bed, 90" x 54"**
- **Stroke, maximum 16"**
- **Rapid traverse, 360" P.M.**
- **Full pressure, 58" P.M.**
- **Mechanical paralleling device to permit handling off-center loads**
- **Hydro-pneumatic cushion**
- **Knock out bars**

The WILLIAMS-WHITE Hydraulic Press, shown above, has been in service for several years turning out stove parts. Equally adaptable to defense material production. For information regarding this and similar machines . . . presses, bulldozers, punches, eye-benders, hammers, etc. . . . write our factory.

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cash for suggestions that are adopted, and in most of the larger plants the top designer is generally one of the judges who rate and screen all suggestions sent in and make the awards.

It's all nonsense for Ed to state that he will get his head taken off and his throat cut later on if he goes into Thompson and suggests the change he and Pierce are certain would produce a better die. That antagonistic attitude between various department heads years ago was a fact. Today it is teamwork right through the plant. No executive is allowed to put himself on a pedestal and adopt the attitude that what he says goes, right or wrong. It just isn't done any more and I have found that if you are in doubt about a job or have a problem, or as in Ed's case a suggestion to offer that might be an improvement in any way at all, the bigger the job the man holds down that you are discussing your problem with, the more humble he is and the more open minded he is and he will go to extra length in thoroughly exploring the possibilities and advantages that might be obtained by any change you may suggest and if he knows that your ideas are of no advantage, he will tell you so and why and I know that you will have learned something from the interview.

On the other hand, and speaking from actual experience, if you have while that executive not only see that what you have suggested is put into practice, he will see that you get the credit for it.

In conclusion Ed, my advice to you is to take Pierce and go see Thompson, and it is odds on that you will get a square deal and the changes you both suggest will be discussed and adopted if they are considered to be of sufficient merit to change the blue print. Or on the other hand, if Roberts sees that your suggestion will not improve the die in any way, or in the making of it, he will tell you why. In any case it is odds on that Roberts will treat you and Pierce with courtesy and with unbiased discussion.

Arthur Silvester
*Niantic, Conn.*

## Ralph Strang—Machine-Tool Envoy

When Ralph Strang died Dec. 23, 1950, in Athens, Greece, there passed from the machine-tool scene one of its ablest veterans.

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Good for tolerances of half a tenth

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At 30 Park Avenue, Manhasset, N.Y., is the widest selection of Swiss precision machine tools available from any one address in the United States. Offered here by Carl Hirschmann Co. are Tornos Screw Machines and Cam Making Machinery; Schaublin Lathes, Collets, Milling Machines and Drilling and Tapping Machines; Lambert Gear Generating Machines and Thread Cutting Machines; Safag Automatics for Wheel and Pinion Cutting, Form Cutter Milling, and Cutter Backing Off; and Agathon Grinders and Die Sets. Offered by Hauser Machine Tool Corp. are Hauser Jig Borers, Jig Grinders, Optical Measuring Machines, Profile Projectors and Burnishing Machines.

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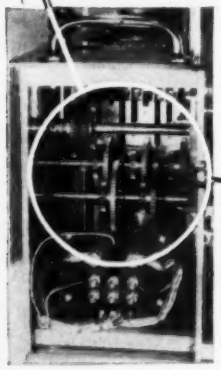
# Mass. Gears

## Applied in Biophysical Research Recorder



The Sanborn Company of Cambridge, Mass., manufacturer of the Poly-Viso Cardiette for biophysical research, is another of the many users of "Mass. Gears." This sensitive instrument calls for the application of gears of extreme precision, a requirement which is inherent in "Mass. Gear" production.

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## Massachusetts Gear & Tool Co.

# di-acro PUNCH

NEW DOUBLE PURPOSE PRESS

Available in two sizes, 6" and 12" throat depth

Now you can punch holes of various shapes as large as 4" diameter in 16 gauge steel—also blank, draw, emboss, form—all with the new DI-ACRO Punch. It is ideal for both experimental and production work.

The precision ground triangular ram of this double purpose press prevents punch head from turning, assuring perfect alignment at all times for accuracy in duplicated parts.

A Turret Stripper of exclusive DI-ACRO design automatically strips material from punches of all shapes. Roller Bearing cam action develops 4-ton pressure with minimum effort. Adjustable gauges assure exact location of holes.

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Gives the full story of the DI-ACRO Punch, and also DI-ACRO Benders, Brakes, Shears, Rod Parters, Notchers, as well as the new DI-ACRO Vari-O-Speed Powershear and Hydra-Power Bender.

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DI-ACRO DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

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Mfg. Co., Columbus, O., he went on to the Gisholt Machine Co. at Madison, Wis., where he graduated from the special-service school. He demonstrated the machines throughout the country. Later he was foreman of the West Steel Casting Co., Cleveland, O.

From Nov, 1918, until May, 1939, he was with the Warner & Swasey Co., Cleveland, O. In 1927 he went to Europe for this firm, and in due time became director of European sales. During these years, he was a familiar figure in the European machine-tool world.

He afterwards became sales manager for Cie Industrielle Franco Belge in Paris. This firm was the agent for a number of American companies, among which Cone Automatic, R K LeBlond, Hall Planetary, and United States Steel were numbered. Because of the war, he returned to the United States and opened a sales office for the Gerard Machine Co., which was controlled by the same management as Franco Belge.

Feeling acutely that his services would be useful to our government, he joined the Office of Production Management, Subcontracting Branch, in July, 1941. Later he became Chief of the Research Service, Unit Facilities Division.

Borrowed by Donald Nelson from WPB, he was sent to Chunking, China, in Feb., 1945, where he materially aided the Chinese in keeping their war industry going. He visited scores of industrial plants, from the largest arsenals to the small community enterprises scattered all over West China, helping the Chinese devise ways and means of utilizing their scanty equipment. The Chinese authorities gave him a Chinese name, which translated means "Never-to-be-forgotten Strang."

In Feb. 1946, he joined Wm. Hunt & Co. in New York, and went to Shanghai for them. He was head of the machine-tool division of that firm, which represented nearly 100 American manufacturers of industrial equipment and machinery.

Forced home by the revolution in China, Mr. Strang returned to Europe in July, 1949, as director for Germany of the Amertool Group of American machine-tool manufacturers.

One year later he went on his last assignment, this time again for the American government, to Athens, Greece. There he served as industrial engineer with ECA. Although he had been in Greece only a few months, it was long enough to have the weight of his machine-tool

# Bodine CASE HISTORY NO. 29

1 — Hand load to dial fixture.

2 — "C" (.242 dia.) drill thru.

3 — C'sink top 1/64 x 45°.

4 — .216 dia. drill thru.

5 — C'sink .216 hole—top.

6 — .216 dia. drill thru.

7 — C'sink .216 hole—top.

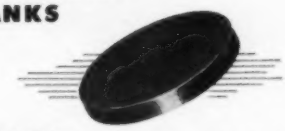
8 — C'sink .242 hole—bottom.

9 — Ream .242 hole to .250.

10 — C'sink 2 - .216 holes—bottom —multiple hd.

Automatically eject.

## TOOLED TO PROCESS BAKELITE BONDED GEAR BLANKS

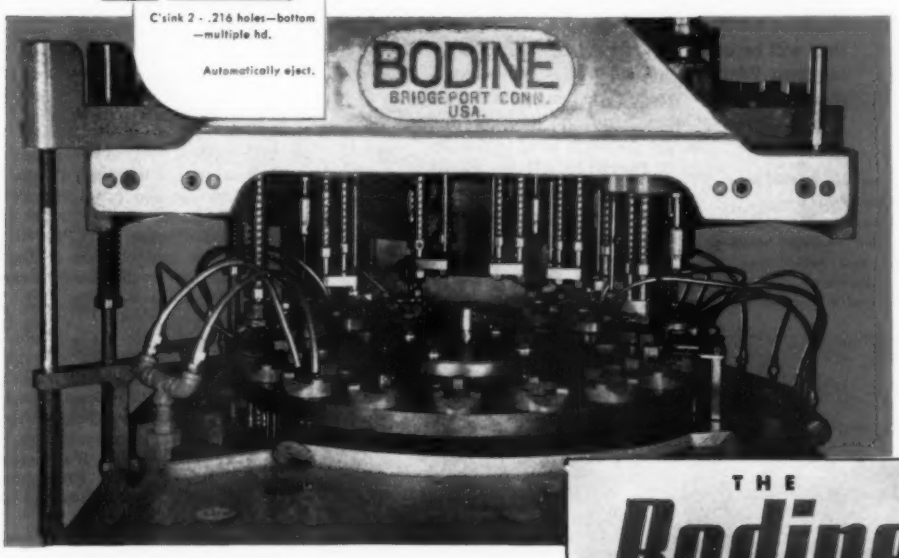


**PRODUCTION:** The Bodine 42-30 Dial Type Automatic Drilling Machine (one of 6 standard sizes) is equipped with 10 drilling spindles. Production is 20 pieces (or 200 operations) per minute.

**ACCURACY:** Center hole held concentric with O.D. within .004" T.I.R. Postion of two .216" Dia. holes held to tolerance of ±.001". Size of center hole held to .250 ±.0005".

This is another example of accurate drilling and countersinking at high speeds... the reason why users of Bodine machines have little worry from competition in repetitive production jobs.

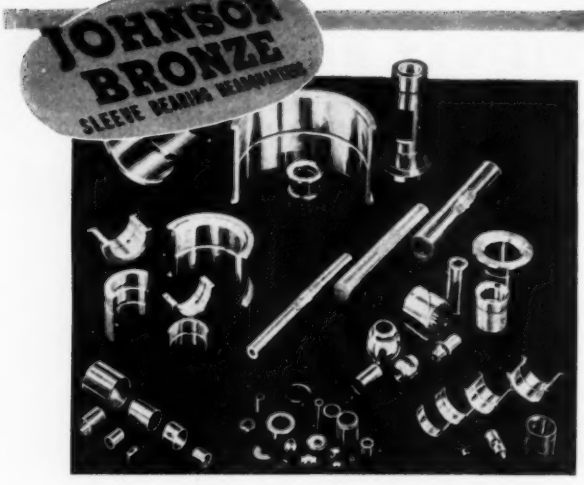
Drilling, Milling, Tapping, Screw Inserting, Staking and Assembly may be performed singly, grouped, or all in one machine. Send part or blueprints for recommendations.




*"You Can't Meet Tomorrow's Competition With Yesterday's Machine Tools."*

THE Bodine CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

2D851

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2. Aluminum Alloy
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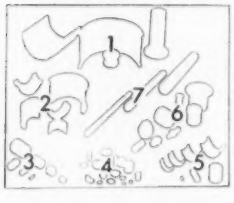
4. Ledaloyl . . . powder metallurgy
5. Steel back, babbitt lined
6. Cast bronze
7. Universal Bronze Bars

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knowledge and experience felt and appreciated by the Greek nation. It knew that in losing him it had lost a valuable asset and friend.

So also feel the thousands of friends he has made wherever he has gone as an enthusiastic specialist—one might almost say as the Johnny Appleseed of the American machine-tool industry.

## NEW BOOKS

ESTABLISHING A COMPANY PROGRAM OF METHODS DEVELOPMENT—*By Ralph M. Barnes, professor of industrial engineering, University of California at Los Angeles. Published by Research Division, California Personnel Management Association, Berkeley 4, Calif. 14 pages, 8½x11, paperbound. Price $1.*

A stenographic brief of an address in which Prof. Barnes discusses the objectives of motion study and job simplification in industry and procedures in introducing a methods program.

•

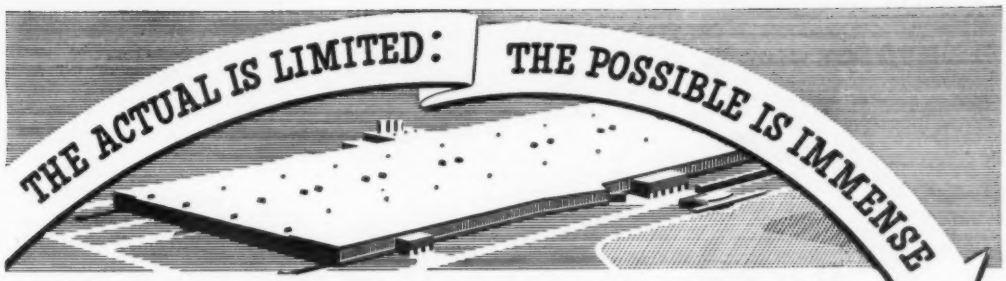
QUALITY CONTROL OF MATERIALS—*Publication STP No. 15-C. 100 pages. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price $1.75.*

This ASTM manual replaces the manual on presentation of data. Part I covers the above subject. Part II presents limits of uncertainty of an observed average, and Part III explains the control-chart method of analysis and methods of presentation of data.

•

MY JOB CONTEST—*By Chester E. Evans and Laverne N. Laseau, Employe Research Section, General Motors Corp. Published by Personnel Psychology, 1727 Harvard St. NW, Washington 9, D.C. 292 pages. Price: paperbound, $2.50; cloth-bound $3.50.*

This book, Personnel Psychology Monograph No. 1, describes a letter-writing contest carried out at General Motors primarily to improve employee attitudes. Topic of the contest was "My Job and Why I Like It." Objectives were: (1) to encourage more constructive attitudes in the minds of employees by

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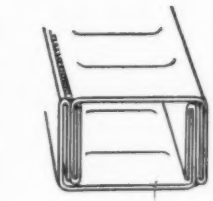

**Fig. 6. Box section** is fabricated from lighter gauge sheet than Figure 5. Flanges are folded metal to increase amount of material at outer edges. Welds are continuous. Has maximum strength per pound. Weighs 5% less than Figure 5. In Automatic Lincolnwelded for lowest fabrication cost.

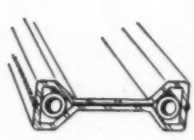

**Fig. 5. Pressed steel section** formed from light gauge metal. Die formed half sections are assembled over steel tubing and Automatic Lincolnwelded at outer edges. Weighs 30% less than Figure 1.

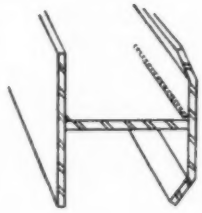

**Fig. 4. Bottom flange** of "I" section can be brake formed from light material and Automatic Lincolnwelded on one side only to web. Saves 10% metal and 30% fabricating cost over section shown in Figure 2.

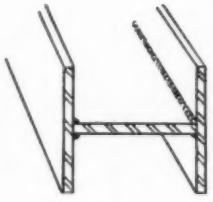

**Fig. 3. "I" section.** Higher strength to weight ratio under lower loading conditions is gained through better distribution of metal in outer areas. Needs 25% less metal than Figure 1 . . . 40% less metal than Figure 2.

## the ACTUAL

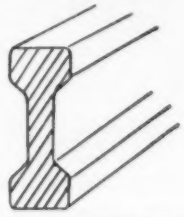

**Fig. 1. Cross section through an iron cantilever beam** designed to resist a bending moment.

## increasing the YIELD

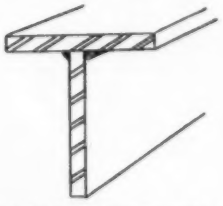

**Fig. 2. Tee section** through comparative beam fabricated by welded steel. Needs 75% less metal than Figure 1 to achieve equal strength in bending.

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stronger products with less metal... at lower cost

SEE HOW WELDED STEEL IMPROVES DESIGN EFFICIENCY

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directing their attention to the positive aspects of their jobs; (2) to place in the hands of employees educational bulletins that would indicate some of the benefits of employment with General Motors; (3) to collect material for the enlightenment of supervision and management; (4) to obtain data for analysis of employees attitudes.

This monograph describes all aspects of the program including administration and promotion of the contest, analysis of the entries, local management's interpretation of its standing in the contest findings, a summary of principles of personnel administration, and implications in the use of this technique for the future. Four appendices give additional detailed information.

•

BUYER'S GUIDE FOR DESIGN OF SCREW-MACHINE PRODUCTS (2ND EDITION) —*By Committee on Manufacturing Standards of NSMPA. Distributed by the National Screw Machine Products Association, 13210 Shaker Square, Cleveland 20, Ohio. 16 pages, paper-bound. Price 25¢.*

This revised guide points out specifications that increase the cost of screw-machine parts and offers suggestions for designing parts for greater economy in manufacture. Customary practice in such factors as burring, concentricity, inspection, and so on also are explained, so buyers will have a better understanding of the factors to be considered in buying screw-machine parts.

*Aircraft Parts Manufacture. Three paper-covered reports published by the Industrial Planning Div., Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio.*

Subject matter of the reports and their titles follow:

HOLE PRODUCTION METHOD. This paper discusses a German system of airframe construction parts, like "Meccano parts," having a row of accurately dimensioned holes. The method is said to reduce the tooling-up time, but the aircraft should be designed with the peculiarities of the process in mind, in order to obtain the potential time savings.

UNIVERSAL FABRICATING MACHINE. Engineers of General Riveters, Inc., report under Contract AF 33 (038) - 2584 on a large portable machine intended to rivet fastments in airframe assemblies that are too large and heavy for existing machine equipment, and cannot be fabricated economically with portable hand tools. This machine automatically drills, countersinks, feeds and heads rivets, and is said to be ten times faster than previous methods.

LARGE FORGINGS IN GERMANY. This 21-page publication reports a lecture by Dr. Hubert Altwicker on the shaping of light-alloy components like engine mounts, airplane wheels, ribs, wing spars, etc., in magnesium alloy. Some details are also given of step-extrusion of large items (later machined at a large saving) for experimental parts.

WHAT DO YOU MEAN-TWO TENTHS IS CLOSE? LOOK, IT'S THAT MUCH-THERE IT IS!
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"SO MUCH YET SO LITTLE".
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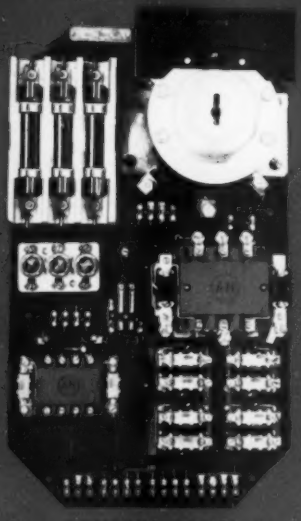
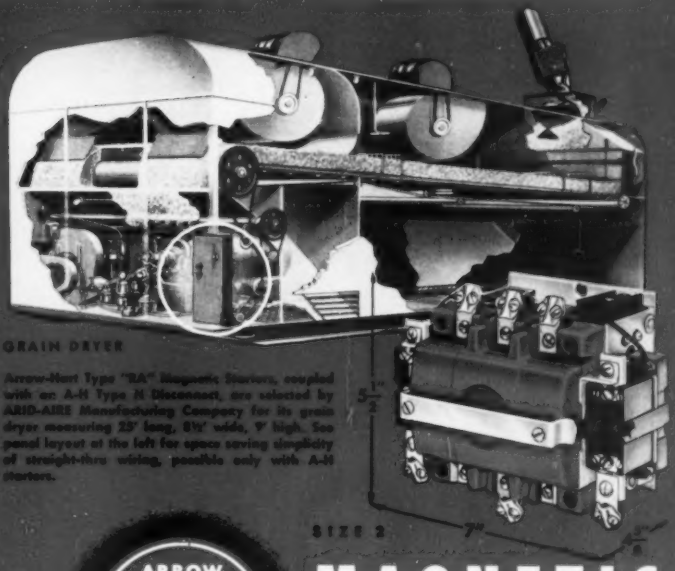


CONTROL PANEL



GRAIN DRYER

Arrow-Hart Type "RA" Magnetic Starters, coupled with an A-H Type N Disconnect, are selected by ARID-AIRE Manufacturing Company for its grain dryer measuring 25' long, 8½' wide, 9' high. See panel layout at the left for space saving simplicity of straight-thru wiring, possible only with A-H starters.

$5\frac{1}{2}$"

7"

SIZE 2

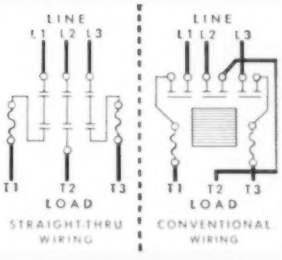
# TYPE "RA" RIGHT ANGLE

ARROW AH HART

# MAGNETIC STARTERS

# JUST 1/2 THE SPACE

## *PLUS* STRAIGHT-THRU FRONT WIRING




Yes, to obtain maximum built-in performance from quality machines, use Arrow-Hart advanced design Type "RA" Magnetic Starters, smallest ever manufactured, first to give you ***straight-thru front wiring.*** This means faster, neater installations at savings up to 30%; safer, direct routing with greater separation of line and load; immediate identification of circuits; elimination of crossing, looping, U-bending; no need for a load terminal on the line side. This simplicity with versatility is ***not*** possible with solenoid or other type starters. Compare the connection diagrams to the right and on the reverse side for conclusive proof of the straight-thru wiring benefits of Arrow-Hart Magnetic Starters — the most logical controls to specify, buy, and use. Available in sizes 0, 1, 2, 3 and 4.

**COMPARE!**

Write for folder complete with design and operating features, dimensions, ratings and other pertinent data.

*BUY WITH CONFIDENCE* *PROFIT BY PERFORMANCE*

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ARROW AH HART

# MORE BIG FEATURES IN JUST 1/2 THE SPACE!

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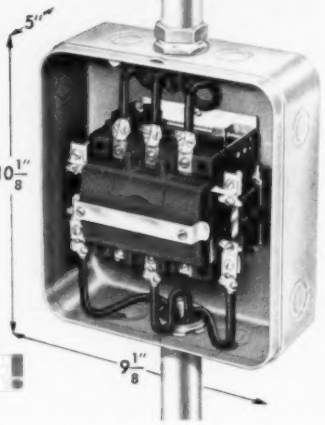
## TYPE "RA" MAGNETIC STARTERS




Arrow-Hart Magnetic Starters occupy just 1/2 the space of conventional starters. This means an overall reduction in the size of the control panel and a substantial reduction of material costs. The exclusive "RA" mechanism sets a new standard for functional simplicity in design — a new and superb performance acclaimed by more and more original equipment designers and manufacturers, electricians and maintenance men.

Other features include high arc resistant and suppression chambers for each set of contacts; big, heavy duty copper contacts with special silver alloy tips; guided parallel closure of contacts; improved magnet and coil; precision calibrated relays. All parts are easy to reach, wire and service for outstanding performance and economy.

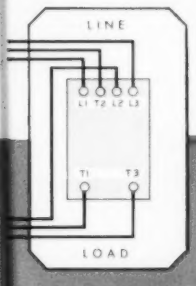
SIZE 2 ILLUSTRATED

MECHANISM DIMENSIONS
DEPTH — 4 5/8" HEIGHT — 5 1/2"
WIDTH INCL. RELAYS — 7"

## COMPARE!

### CONVENTIONAL WIRING

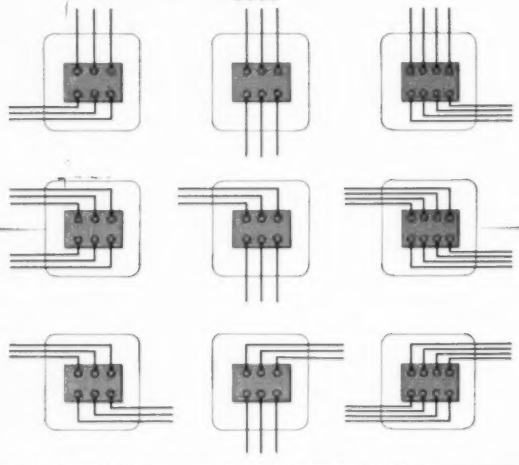
**3 PHASE STARTER**




**AH EXAMPLE** of wiring nuisance existing with old type solenoid starters. One load wire must be brought in to the line side.

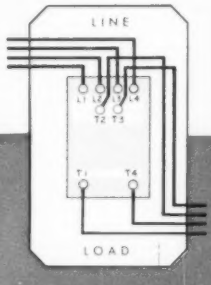
### ARROW-HART STRAIGHT-THRU FRONT WIRING

**LINE OR LOAD**



### CONVENTIONAL WIRING

**2 PHASE 4 WIRE**




**ANOTHER EXAMPLE** of scrambled wiring. Makes circuit identification more difficult and invites sequential errors.

Write today for folder and engineering data on Arrow-Hart Type "RA" Magnetic Starters and Contactors, complete with ratings, dimensions, and parts information. Available in local and remote control or selector switch types in sizes 0, 1, 2, 3 and 4. Consult your local electrical distributor or write the factory for engineering service. Field engineers are in your territory to assist you.

# ARROW·HART

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103 HAWTHORN STREET
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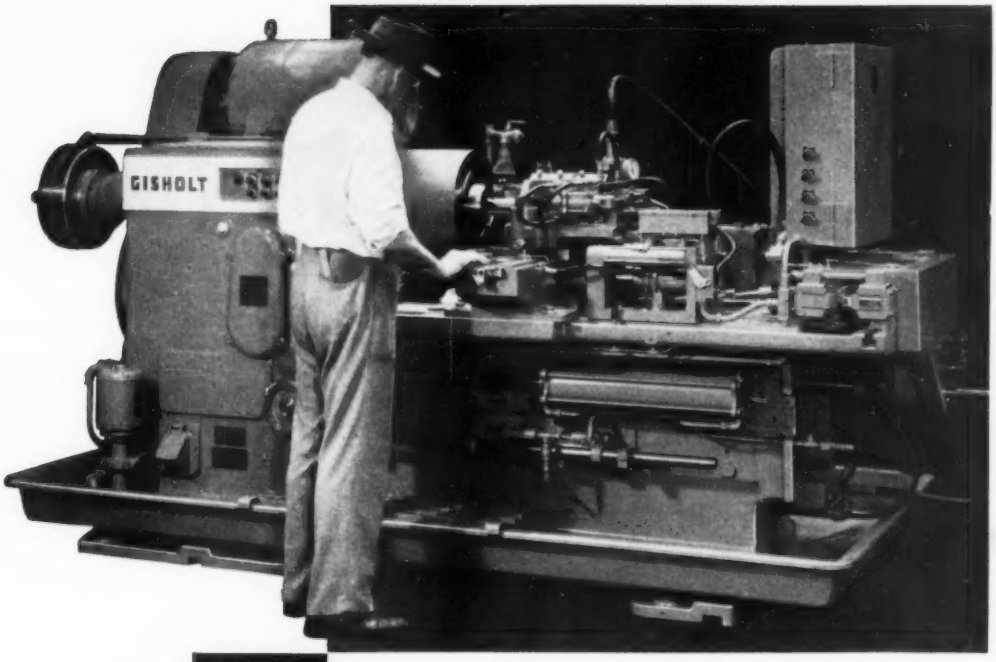


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## *cut man-hours 75%*

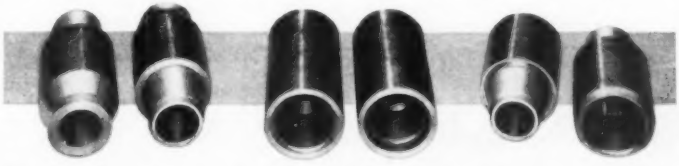
The way you can slash costs with the Gisholt Simplimatic often surprises some of the most experienced production men.

Here's a big shop which found that 8 Simplimatics could take over the job done on 16 other machines. And it takes only 4 operators instead of 16 to turn out the volume of parts required.

Not the least in the cost picture is the machine itself. For the basic Simplimatic design permits you to individualize the machine to a high degree to solve many different problems. Thus, for many jobs you can have all the advantages of a special machine merely with special tooling. Yet it's all done on a Standard Simplimatic—at far lower cost.

The importance of lower costs these days makes it important for you to get all the facts about Simplimatic Automatic Lathes.

**The GISHOLT ROUND TABLE** *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*



*In producing these tool joint pins and boxes, the 8 Simplimatics work in pairs with fully automatic operation: one man can easily tend two machines.*

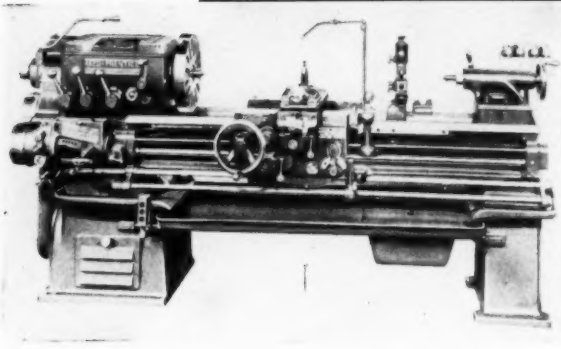
*Ask about the many different arrangements possible on the Standard Simplimatics with platen table, vertical head, etc.*

**GISHOLT MACHINE COMPANY,** *Madison 10, Wisconsin*

**TURRET LATHES • AUTOMATIC LATHES • BALANCERS • SUPERFINISHERS • SPECIAL MACHINES**

# REED-PRENTICE

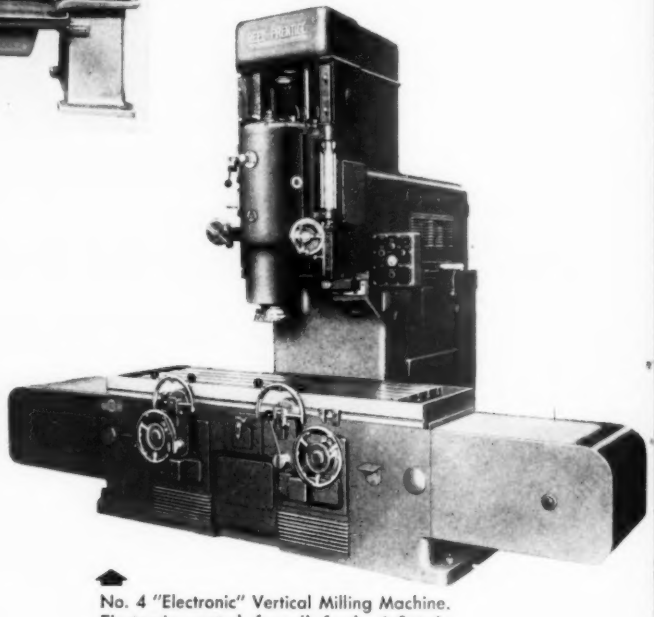
## *Precision-Built*



14", 16" and 20" Engine and Toolroom Lathes. Sliding Gear Head construction. Anti-friction bearings throughout headstock, endworks, apron and quick change mechanism. Center distances from 30" up in increments of 24".

Over 80 years of engineering and manufacturing "know-how" enable Reed-Prentice to offer machine tools built to give years of trouble-free service. Reed-Prentice Engine and Toolroom Lathes—manufactured to the most exacting standards—are known throughout the metalworking industry for their accuracy and dependability. And in the line of Reed-Prentice Vertical Millers, you'll find an efficient, rugged machine for every milling and die sinking purpose.

We'll be glad to furnish full details on the latest design and operating features of Reed-Prentice Lathes and Millers. You need only fill in and mail the coupon provided below to receive this information.



No. 4 "Electronic" Vertical Milling Machine. Electronic control for all feeds. Infinitely variable feeds. Table working surface 24" x 84" or 96". Longitudinal travel of table 48" or 60". Travel of cross slide 24". Table to spindle nose, max. 24". Weight 48" — 20,500 lbs., 60" — 24,500 lbs.

MACHINE TOOLS

**REED-PRENTICE CORP.**

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# Machine Tools-
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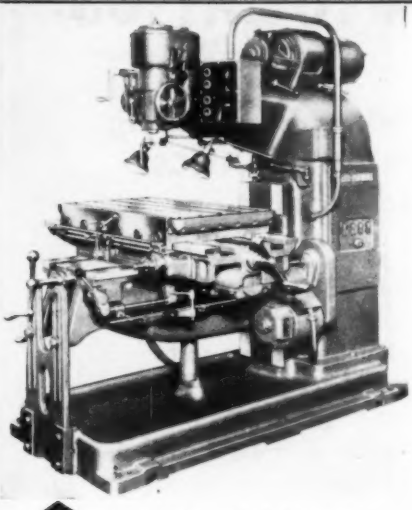
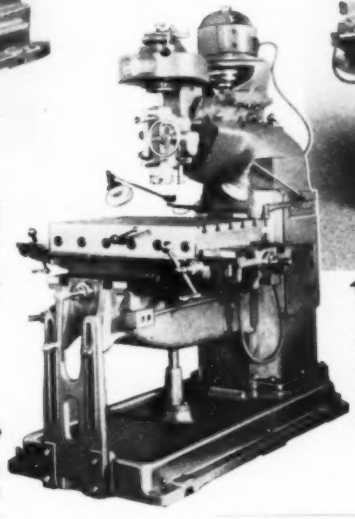
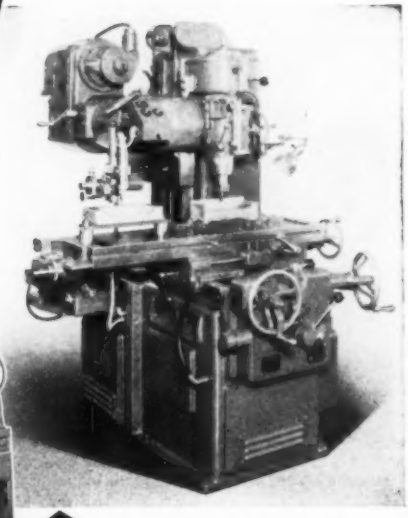


No. 22-VS Universal Head Vertical Miller and Die Sinker. Electronic controls for spindle speeds and power feeds. Longitudinal feed 27". Cross feed 20". Vertical feed 16". Spindle to table, max. 20". Table working surface 32" x 22". Weight 6500 lbs.



No. 22-V Vertical Milling Machine. Heavy-duty type. Longitudinal feed 27", Cross feed 20". Vertical feed of knee 16". Ram adjustment (horizontal) 16". Spindle to table 20". Table working surface 32" x 22". Weight 6500 lbs.



No. 12-V Universal Head Vertical Miller. All-purpose milling and die sinking machine. Shown with Electronic Duplicator attachment. Longitudinal feed 28". Cross feed 12". Vertical feed 14". Table working surface 12" x 46". Spindle to table, max. 18". Weight 5800 lbs.

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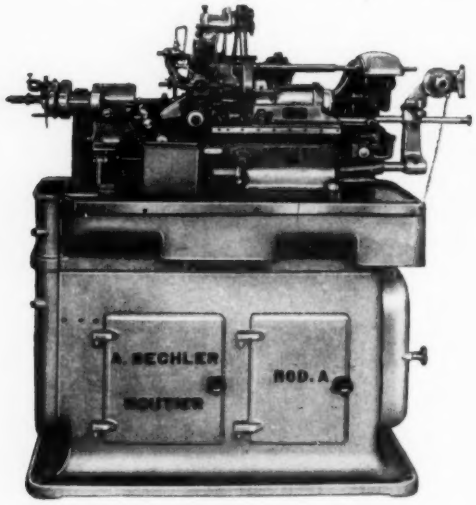
## *with*
# BECHLER SWISS AUTOMATICS




Model A-10 BECHLER AUTOMATIC has 3/8" diameter capacity, 2¾" turning length, 5 cross tools. This Automatic is equipped with single spindle threading attachment and slotting attachment for producing PRECISION SCREWS.

### The advantages of using BECHLER AUTOMATICS to speed production:

1. Over 20 spindle speeds.
2. 88 camshaft speeds for each spindle speed selected.
3. More than 30 different attachments.
4. A new device prevents the breaking of carbide tools.
5. Easiest tool adjustments.

### DIAMETER CAPACITIES

BECHLER AUTOMATICS

| | | | | |
|---|---|---|---|---|
| Model AS | 5/64" | 5/32" | 9/32" | 3/8" |
| Model A | — | 5/32" | 9/32" | 3/8" |
| Model B | 1/2" | 5/8" | 3/4" | — |
| Model C | 1" | 1¼" | — | — |

BECHLER ISOMATICS

Automatics for constant and highly accurate production of very small parts.

| | | | |
|---|---|---|---|
| Model AS | 5/64" | 5/32" | 9/32" |
| Model A | — | 5/32" | 9/32" |

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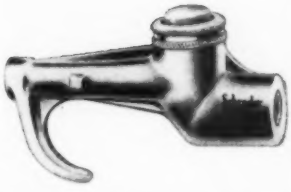
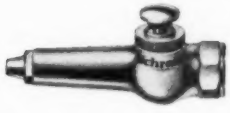
*NATIONAL REPRESENTATIVES FOR:* REISHAUER—Gear & Thread Chaser Grinders—Lead Screw Lathes • BECHLER—Swiss Automatics—Cam Shapers • DECKEL—Engravers and Copy Millers • MICAFIL—Coil Winders • SALLAZ—Burnishing Machines • SCHUTZ—Forming and Cutting-Off Machines STUDER—Profile Grinders.

# There is a Schrader® blow gun for every job

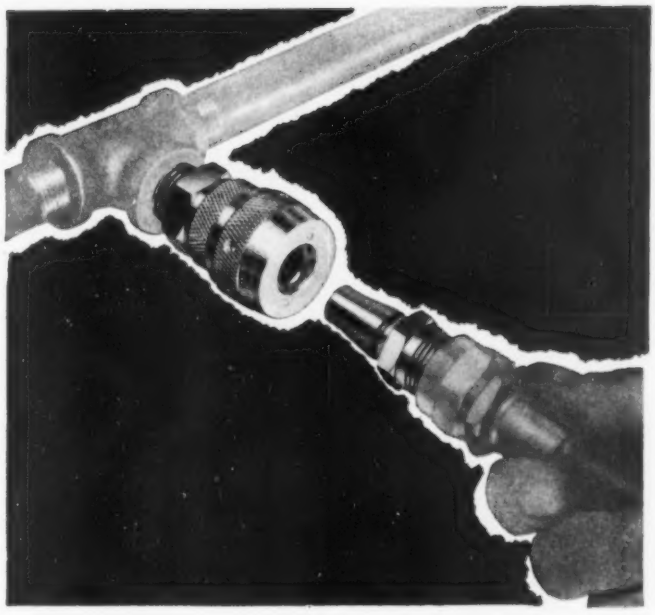


**This drop forged stainless steel blow gun** is designed to stand up under hard, steady use. It is practically indestructible. The stainless steel construction increases corrosion resistance and gives you a positive guarantee of longer, trouble-free service.



**Button Type**—This sturdy all-purpose forged brass blow gun operates at the press of a button. A popular all-round blow gun that has proved indispensable to hundreds of thousands of users.

**Lever Type**—A controlled flow of air, from a puff to a blast, is a feature of this precision-control blow gun. Its design and lever position provides a natural grip for thumb control of air flow.



# Now Compressed Air can be as convenient as electricity

With Schrader Quick Acting Couplers you can have air where you want it and when you want it—with the "plug-in" convenience of electricity. They can be installed at handy places along walls, benches or columns . . . bringing air right to the "point of work."

A quick push snaps the Schrader swivel adapter into the check unit . . . opens line pressure and locks to make an air-tight connection. It requires only a positive manual twist of the check unit sleeve to uncouple. These fittings come in a variety of adapter and thread sizes

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These are just two of the many Schrader air line fittings that can help you make air as convenient to use in your shop as electricity. Ask us to help you determine what will best fit *your* needs. Send us a letter outlining your particular installation, your idea, or fill out the coupon below.

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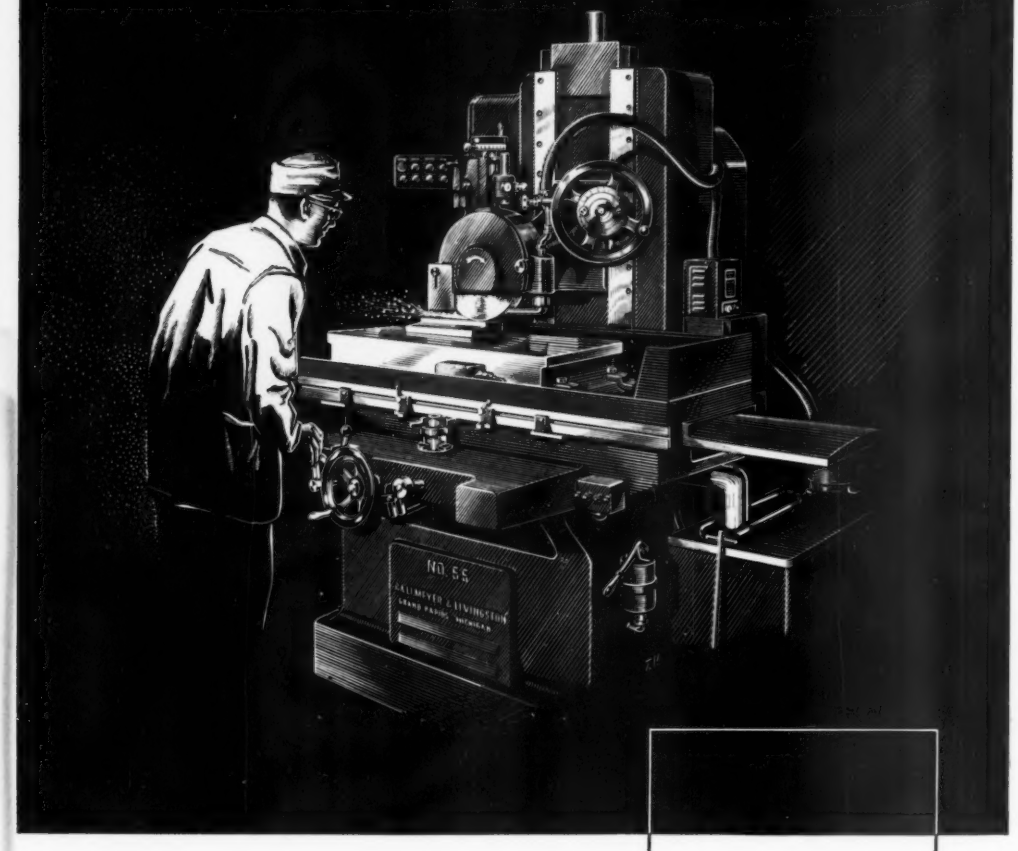
## *WHEN THE DECISION IS* PRECISION...




Where extreme tolerances are not required, the choice of any particular grinding machine may not be too important. But, where absolute precision is demanded, the choice is usually *Grand Rapids.*

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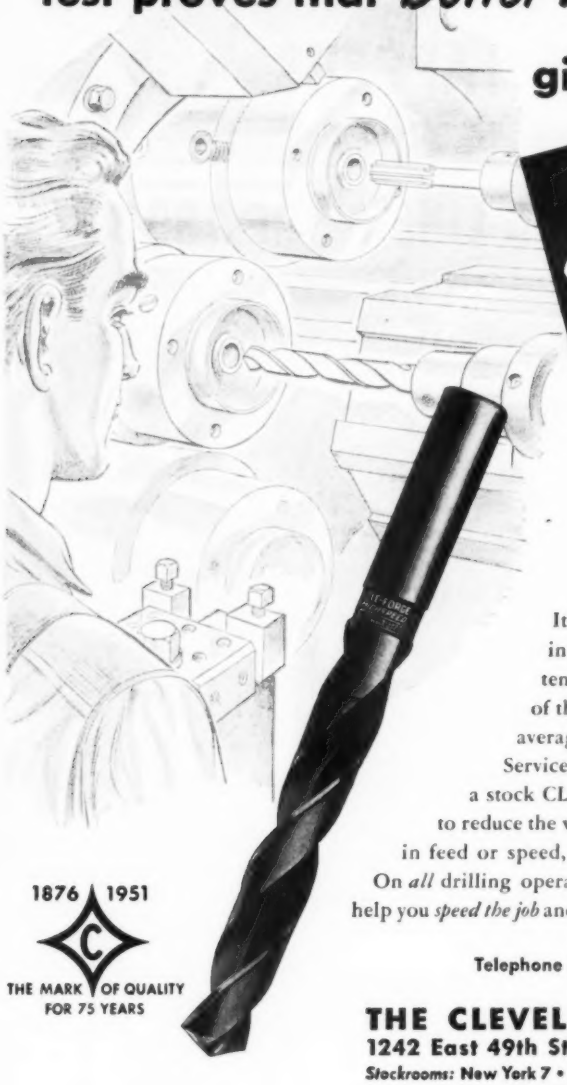

## MORE HOLES PER GRIND

It was a smooth-running job—drilling 1 9/32" holes in a cast iron cover, ½" thick—but the superintendent wasn't satisfied with the wearing qualities of the high speed drills that were being used. They averaged 2705 holes per grind. ◈ When a *Cleveland* Service Representative was called in, he recommended a stock CLE-FORGE High Speed Drill that is engineered to reduce the wear caused by abrasive action. With no change in feed or speed, this drill averaged *3862* holes per grind! ◈ On *all* drilling operations, a *Cleveland* Service Representative can help you *speed the job* and *cut costs.* Contact our nearest Stockroom, or . . .

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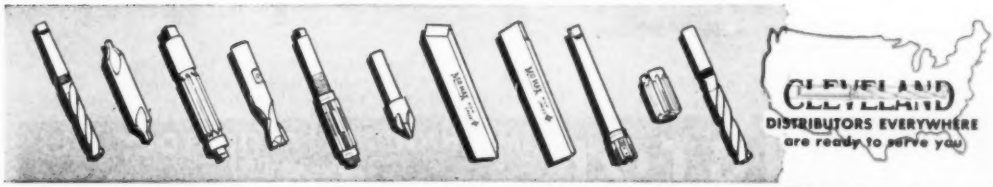




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## *the* LEADING LINE SINCE 1891

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For blind holes, tapping in steel, copper, etc. wherever there is danger of breaking taps.

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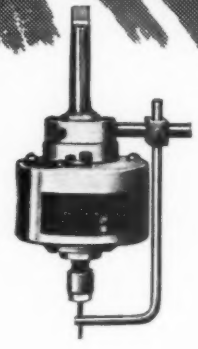
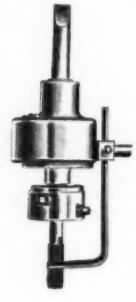
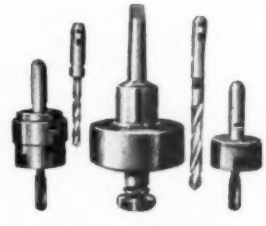
**BALL BEARING CONE-DRIVE**
Designed for Ball Bearing High Speed Drill Press.





**POSITIVE**
For through holes where work is drilled and then re-handled and tapped.

**QUICK-CHANGE**
Tool-Holders to Drill, Tap and Set Studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tap-holder, if required.



***These Tappers may also be adapted for button or acorn die threading.***

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*Established 1891*
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*Formbrite is a trademark of The American Brass Company designating copper-base alloys of exceptionally fine grain, combining unusual polishing characteristics with good strength and hardness, plus excellent ductility.*

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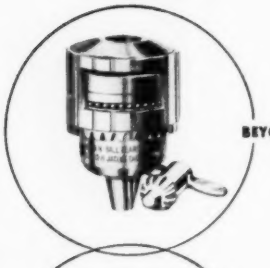
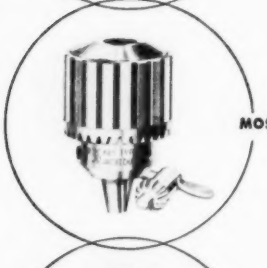


**BEYOND ALL COMPARISON.** Say "Jacobs Ball Bearing Super Chuck" and you've mentioned the last word in drill chucks. No other chuck ever made compares with this blue-chip wonder — in which Jacobs' famous ball bearing construction, tough alloy steels and precision workmanship combine for the tightest practical grip and great accuracy. That's why the Jacobs Ball Bearing Super Chuck is tops throughout the world for heavy-duty drilling.



**MOST WIDELY USED DRILL CHUCK IN THE WORLD.** Made of the same rugged materials and to the same close tolerances as the Jacobs Ball Bearing Super Chuck, the Jacobs Plain Bearing Chuck is particularly designed for portable tools and light and medium duty drill presses and lathes. Because of its matchless gripping power and accuracy it has been incorporated as standard equipment by the overwhelming majority of portable tool users both here and abroad.

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**20 Jacobs Road, West Hartford 10, Connecticut**

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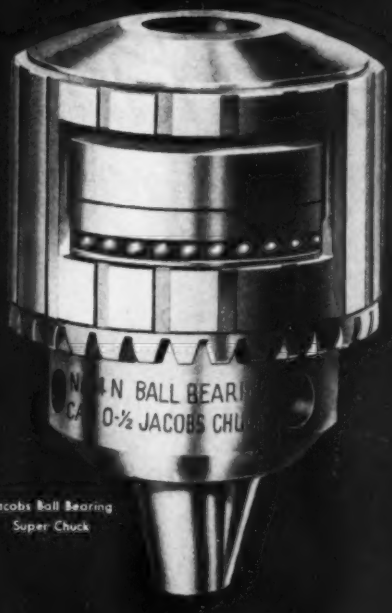


Jacobs Ball Bearing
Super Chuck

Jacobs Plain Bearing
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**solution:** The Coan Mfg. Co. switched from the set-up wheel to the backstand belt method for this finishing job.

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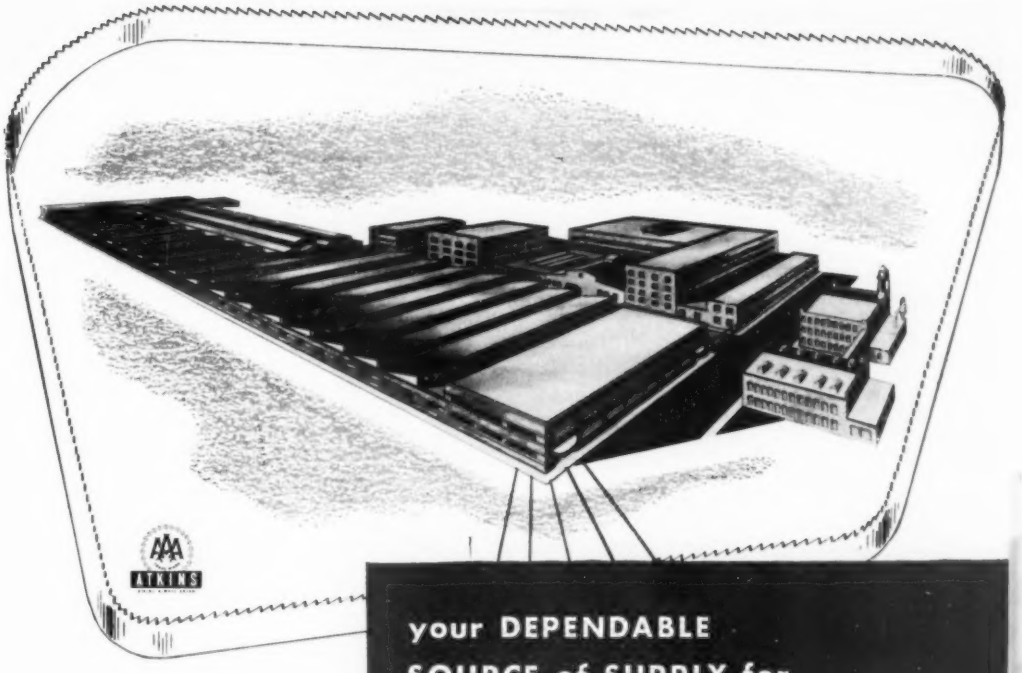

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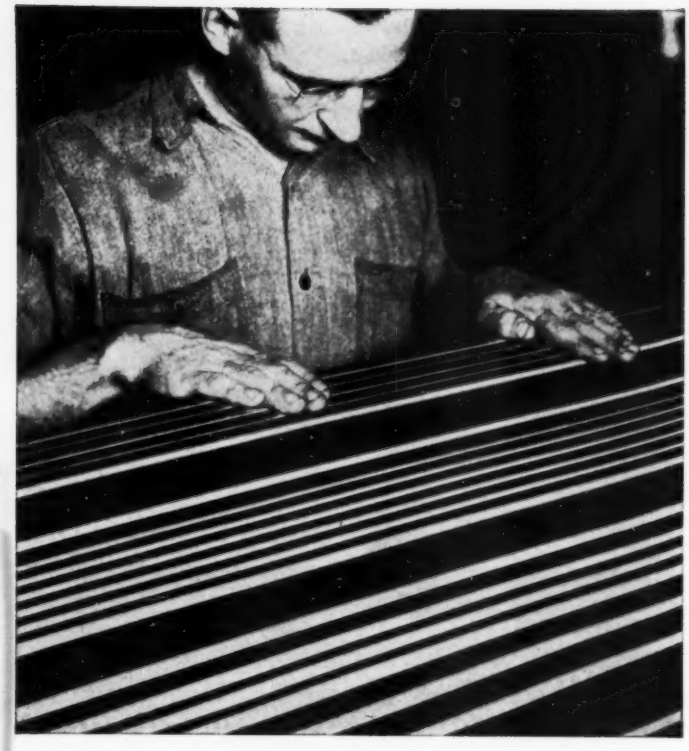
**TRIPLE MILL SUPPLY CONVENTION**
San Francisco Civic Auditorium
JUNE 12, 1951
**BOOTH No. 202**

# ATKINS



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| Broaches | | Flue-expander Rollers | Mandrels | Scale Pivots | Vise Jaws |
| Cams | | Gauges | Nail Sets | Screw Drivers | Wood-cutting Tools |
| Chasers | | Gears & Pinions | Nut Punches | Set Screws | Watch Parts |
| Chuck Jaws | Dowel Pins | Instrument Parts | Perforating Punches | Shafts | and similar products |
| Collets | Drift Pins | | Pipe Grips | Spindles | |

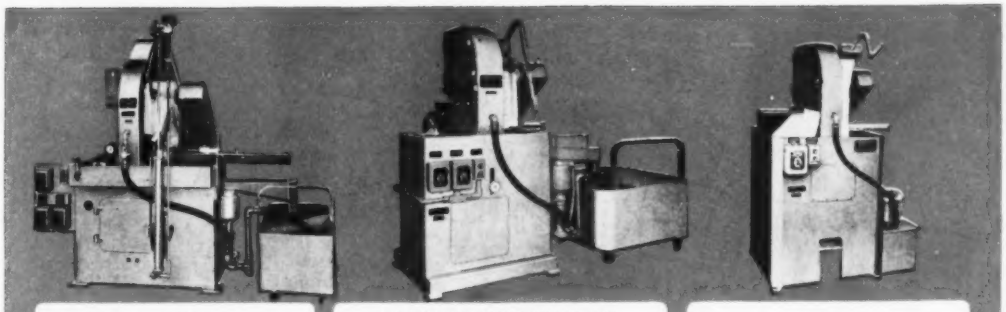
If you want better quality, accuracy, and finish on your products—with economy—call us. No obligation. ● *Allegheny Ludlum Steel Corporation, Henry W. Oliver Building, Pittsburgh 22, Pa.*

For complete **MODERN** Tooling, call

**Allegheny Ludlum**

AL FINE TOOL STEELS SINCE 1854

W&D 3531

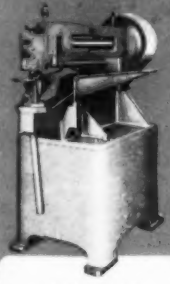


**Model 406 ABRASIVE CUTTER**
• 20" maximum diameter cutting wheel. Capacity 6" diameter solids. Work manually fed. **Model 476** same capacity, fully automatic.

**Model 223 ABRASIVE CUTTER**
• 16" maximum diameter cutting wheel. Capacity 2" diameter solids. 4" diameter tubing. Manually operated. **Model 265** hydraulic type, work fed manually. **Model 270** fully automatic.

**Model 15 ABRASIVE CUTTER**
• 14" maximum diameter cutting wheel, cuts wet or dry. Capacity 1" diameter solids, 2" diameter tubing.

# 3 . . . of a Complete Line of CAMPBELL ABRASIVE CUTTERS



**MODEL 2524 NIBBLING MACHINE**
• One of a line of high speed, variable stroke Nibblers for cutting regular and odd shapes from metal sheets quickly and inexpensively.

• For fast, high quality cuts . . . with a smooth, straight finish . . . from hard or soft stock . . . round, hex, square or shaped. Perfected design assures highly accurate cuts within close tolerances.

**SAFER TO USE** Cutting wheels are enclosed in steel. Work clamp, work stop, and coolant pump are automatic on most models. Coolant is distributed equally over cutting wheel . . . wheels last longer.

**LOWER COST** Smooth, almost burr-free ends often eliminate subsequent operations. Stock need not be annealed before cutting. Abrasive cutting saves material . . . makes cuts fast and at lowest cost. For low cost, high quality cutting use **CAMPBELL ABRASIVE CUTTERS.**

All CAMPBELL machines are completely re-engineered for high production performance . . . ready for the emergency.

*YOU TELL US.* **CAMPBELL** *has a complete line of Abrasive Cutters and Nibblers. You tell us your job. We'll send literature and make recommendations.*

*Ask for your copy of Bulletin* **DH-171**

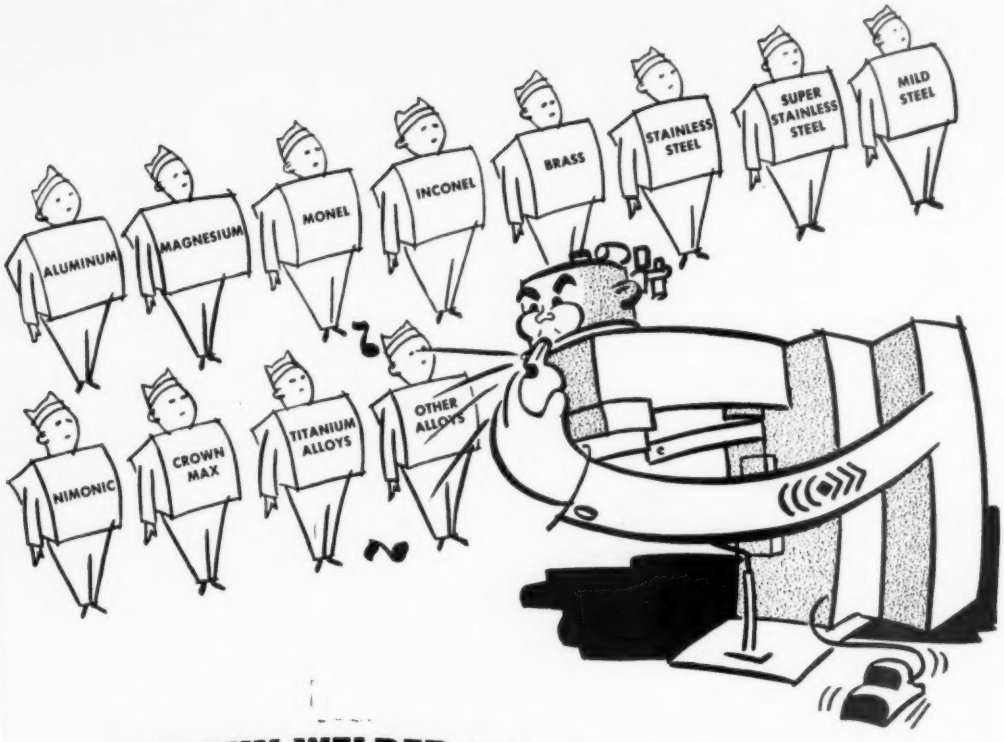
**ACCO**

TRADE MARK

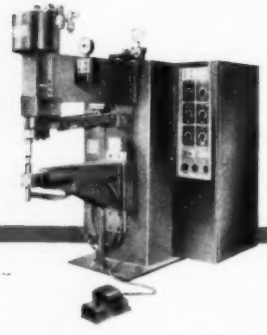
**CAMPBELL MACHINE DIVISION**
**AMERICAN CHAIN & CABLE**

**923 Connecticut Ave., Bridgeport, Conn.**

CAMPBELL Abrasive Cutters AND Nibblers




# THIS SCIAKY WELDER CAN HANDLE THEM ALL . . .



***Brief Specifications Series PMCO2ST Resistance Welder***

**100 KVA at 50% duty cycle. 220 and 440 volt 3-phase 60 cycle standard. Available with special controls for 25 and 50 cycle current. Standard throat depths 36", 48" and 54". Welding range to MIL specifications (two thicknesses): aluminum and magnesium alloys .025" to .081". SEND FOR NEW BULLETIN.**

THE new Sciaky Series PMCO2ST Resistance Welder is quickly adjustable to weld any one of the metals listed above . . . and Sciaky guarantees to qualify this machine to MIL 6860 and 6858 Air Force-Navy Specifications at time of installation in your plant.

Here, then, is the most versatile welder you can buy to meet defense production requirements. Quality of welds is unsurpassed. Tip life is increased as much as 300% or more over previous models. The PMCO2ST is backed by Sciaky's experience in building nearly all of the resistance welders used for military aircraft production in this country since 1940.

For complete data, WRITE FOR NEW BULLETIN.

**SCIAKY BROS., INC.**
**4719 West 67th Street**
**Chicago 38, Ill.**

SCIAKY
SAY "SEE-ACKY"

## Bellows "Controlled-Air-Power" Relieves the Shortage of Skilled Machine Operators

Take a look around your plant. Wherever you see an operator hand feeding a part to a tool or a tool to a part, there's an operation you can perform faster, safer and better with Bellows "Controlled-Air-Power" Devices.

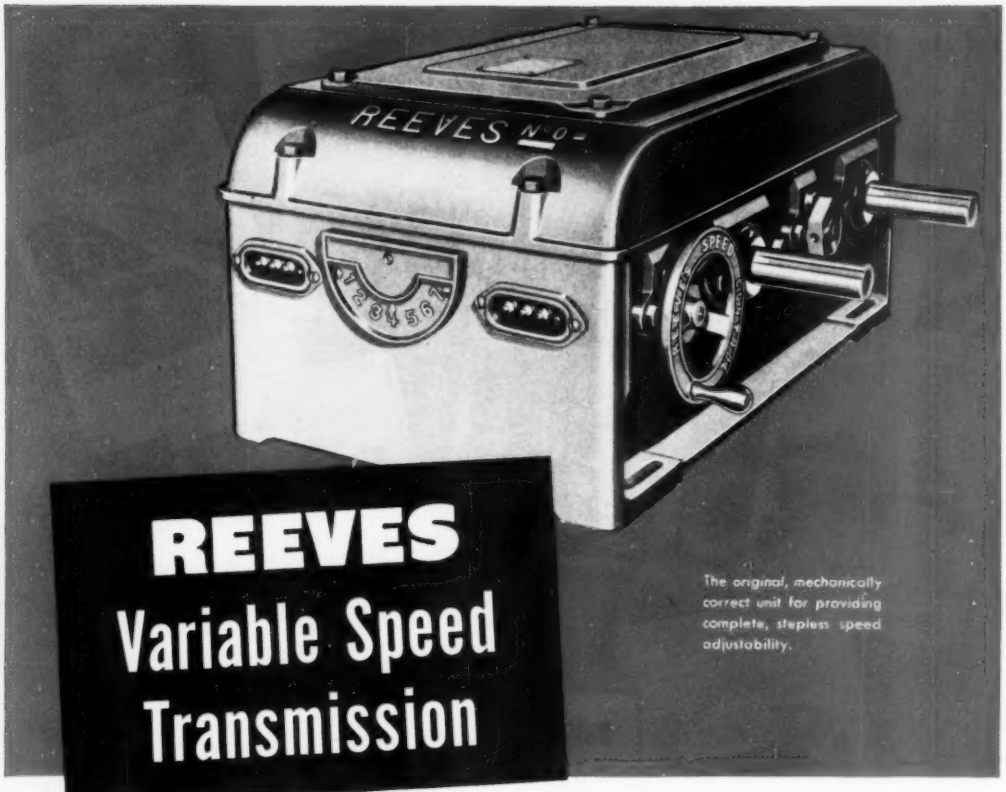
These unique "packaged" air-powered units double, triple and even quadruple the output of standard machine tools; add immeasurably to the productive capacity of your highly essential skilled labor supply.

Call a Bellows Field Engineer. He's listed in the phone book in over a hundred cities under "The Bellows Co." Ask him to look over some of those manually handled operations. Let him show you case history after case history of just what Bellows "Controlled-Air-Power" is doing. It won't cost you a cent to look. It may help you solve more than one serious problem.

*If there is not a Bellows Field Engineer near you, write us and we'll be glad to send you our latest Foto Facts File . . . complete case histories showing what Bellows equipment is accomplishing in plants large and small in all industries.*

*Address: Dept. AM 551*

The Bellows Co.
AKRON 9, OHIO




# REEVES Variable Speed Transmission

The original, mechanically correct unit for providing complete, stepless speed adjustability.

## Industry's most widely used unit for adjusting machine speeds . . . for all these good reasons:

1. Incorporates the REEVES operating principle—proved in 300,000 installations—which assures *accurate, positive* delivery of any desired speed within the entire speed range, without stopping the machine.

2. Makes "changeovers" easier—utilizes the machine's *full* capacity—by providing the *right* speed—with the turn of handwheel or touch of button—for every operation and every operator, under every changing condition.

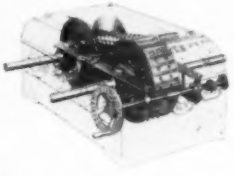
3. Wide choice of vertical and horizontal models—capacities up to 87 hp; in speed ratios of 2:1 to 16:1; manual, electric, hydraulic or completely automatic controls; suitable for mounting in any position. Also "Internals" for mounting within machine framework.

4. Easily installed on your machines. Ruggedly constructed with few moving parts subject to wear . . . requires no special tools or training to maintain.

5. Used on more different kinds of machines in a greater variety of industries than any other single variable speed drive.

Profit from REEVES Speed Control in your plant—*see immediate results.* Send for full details on REEVES Speed Control—ask for catalog No. A 68-G.

## Operating Principle



REEVES Variable Speed Transmission embodies the proved operating principle of a V-belt driving between two pairs of cone-shaped discs, mounted on parallel shafts and adjustable to form an infinite number of driving and driven diameters. One shaft receives power at constant speed from motor, line shaft, etc. Other shaft delivers power at infinitely variable speeds to driven machine. Each speed setting is held without fluctuation. Operation is practically noiseless.

**REEVES PULLEY COMPANY • COLUMBUS, INDIANA**

*Re ognized leader in the specialized field of speed control engineering*

accurate • variable
**REEVES** *Speed Control*

# HERE'S HELP FOR YOUR CARBIDE TOOLMAKER

## . . . his big problem today is getting the best carbide to do your job!

. . . BEST *for performance*

. . . BEST *for availability*

. . . BEST *for price*

● Think twice when indicating your carbide grade specification . . . don't limit your carbide toolmaker to a brand or grade of carbide which is unavailable or not *best* suited for your job.

Independent carbide toolmakers have found through years of experience that ADAMAS enables them to turn out better tools on a faster delivery schedule. The availability of a complete line of standard and special tips in *work-proved* grades has made them eager to use ADAMAS tungsten carbide.

Specify an ADAMAS grade on your next job and have the advantages of ADAMAS *quality, delivery and price.*

**YOU CAN HELP YOUR CARBIDE TOOLMAKER BY SPECIFYING**

**ADAMAS**

*The revised ADAMAS "Carbide Manufacturers' Grade Recommendations" showing grade recommendations of all carbide manufacturers will help you in selecting the proper tungsten carbide for your job. Write for your FREE copy.*

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**CARBIDE CORPORATION**

Harrison, New Jersey

Producers of top quality carbide for cutting tools, dies and wear resistance.

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**Dept. A, Harrison, New Jersey**

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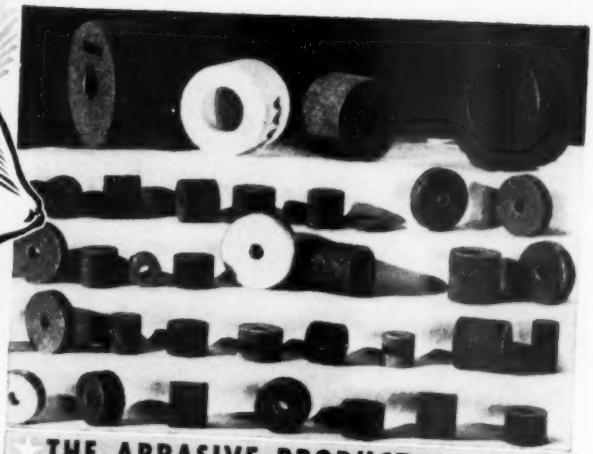
# "UP-ING UNCLE'S MUSCLE"

Bay State internal wheels have been "inducted" for a host of Defense Jobs . . .

Aircraft Cylinder Sleeves
Anti-Friction Bearings of All Kinds
Gun Barrels
Propellor Hub Cones
Connecting Rods
Aircraft Crankcase Assemblies
Cartridge Dies
Tank Turret Housings and Shields, etc. etc.



**THE ABRASIVE PRODUCT**
**Bay State Internal Wheels . . . Quality Control Manufactured in Fractional Grades.**

**THE GRINDING JOB**
**Internal Grinding Crank Holes in Four Aircraft Conn Rods Simultaneously.**

*Ask for Bay State engineered-help on your next job.*

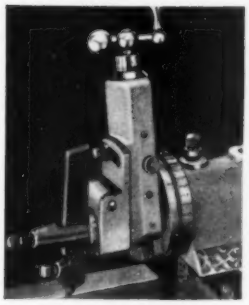
**BAY STATE**

**BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass.**

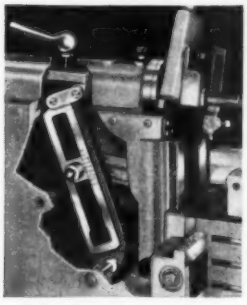
*Branch Offices and Warehouses — Chicago, Cleveland, Detroit, Pittsburgh*
*Distributors — All principal Cities*
*In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ontario*

★ KEEP AMERICA STRONG ★

# SOUTH BEND 7" PRECISION SHAPER



*Tool head locks in any position. Rugged clapper box also adjustable.*



*Rocker and crank with graduated eccentric adjustment for stroke.*

*Guards on all belts and pulleys. Quick-acting belt tension release.*

## *Saves Time...Saves Labor*

It's fast—accurate—easy to operate. The South Bend 7" Precision Shaper can consistently give you low machining costs on small parts. Designed to handle a wide variety of work in this class, it will enable you to release larger shapers for heavier work, save on machine investment and economize on both power and upkeep. Find out how this versatile shaper can give you better production, toolroom or maintenance machining. *Send coupon for literature.*

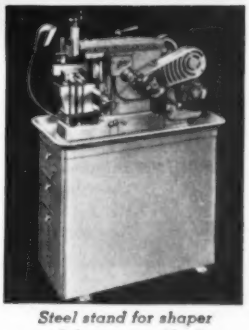
### SPECIFICATIONS

**RAM**—Stroke length—0 to 7". Strokes per minute (4)—42 to 195. Cutting speeds—3 to 114 feet per minute.

**TOOL HEAD**—Vertical feed—3". Swivels—360°. Tool Post opening—13/32" x 7/8".

**TABLE**—Horizontal travel—9-1/2". Vertical travel—5". Power cross-feeds (6)—.002" to .012". Ram clearance—1/2" to 5-1/2". Table size—5-3/8" x 5" x 6-5/16".

**VISE**—Jaw width—4". Jaw depth—1". Maximum opening—4". Swivel base.



*Steel stand for shaper—3 drawers and built-in chip pan.*

THE NATIONAL GUARD DEFENDS AMERICA

**SOUTH BEND LATHE**

SOUTH BEND 22, IND. • *Building Better Tools Since 1906*

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*Send Information Checked:*

☐ 7" PRECISION SHAPER ☐ LATHE ATTACHMENTS

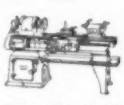
Name_____

Company_____

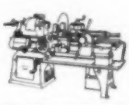
Street_____

City_____ State_____

☐ 9" and 10" BENCH LATHES



☐ 10" to 16-24" FLOOR LATHES



☐ 1/2" and 1" collet TURRET LATHES

☐ 14" DRILL PRESSES

## A Look at the SPECIFICATIONS SHOWS YOU WHY THIS DRILL CAN REALLY PRODUCE!

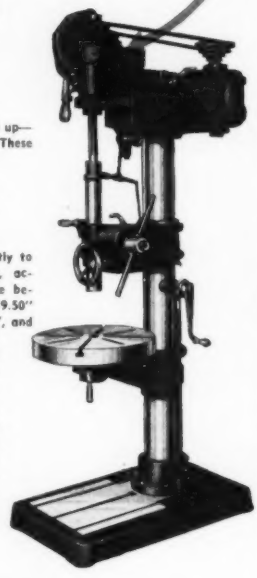
Today's tight shop schedules call for drills that can stand up—like the "Buffalo" No. 22 Round Column Drill shown. These specifications show why:

| | |
|---|---|
| COLUMN DIAMETER—(steel) | 5.5" |
| SPINDLE—LEAST DIAMETER | 1.312" |
| HEIGHT (spindle raised) | 94" |
| DRILL CAPACITY (cast iron) | 2" |

Spindle runs smoothly on ball bearings and is held tightly to avoid deflection—for long, accurate use. Maximum space between spindle nose and the 19.50" O.D. working table is 27½", and you can drill to the center of a 22" circle. WRITE FOR BULLETIN 2989-F for further facts on these drills.

"BUFFALO" HAS THE DRILL FOR YOU!

Starting with the No. 14 high-precision drill for up to ⅜" holes, "Buffalo" builds 9 different types of drills to suit every requirement, on up to the big "RPMster" with 1000 instantly changed speeds. WRITE US ABOUT YOUR TYPE OF OPERATION, and we'll mail you applicable bulletins.



**BUFFALO FORGE COMPANY**

509 Broadway Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING



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## McGRAW-HILL Pre-filed ELECTRICAL CATALOGS

when you need buying information on *electrical products* in your plant.

This compilation of manufacturers' catalog data will save time and provide the answers to such questions as:

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### From the *American Machinist* Library of *Tips for Top Shop Men*

TAKE a man's pride in his job away, and there isn't much left; he becomes another automaton. Even a trained seal enjoys the applause as much as he does the fish.

WHEN you walk the tight-rope between close tolerances, or between good and bad finish, balance is vital. Be sure you have it, in machine-tool spindle or shaft, in tooling, in fixture. It will pay out in longer tool life and reduced scrap.

# Every Minute Meant a $1920 saving

Big return for a minute's time . . . but to a leading Philadelphia manufacturer* a 5 minute interview did result in a total saving of $9600.

This manufacturer faced a problem that's common to many plants today. His ten machines have 560 bearings—560 bearings that must be kept lubricated if production is to be kept uniform, rejects few. That lubrication job was taking four man hours every week and, because of human fallibility, there was always the potential danger that one of these many bearings had been overlooked or under lubricated.

An Alemite Lubrication Engineer was called in. He made his presentation in just 5 minutes—5 minutes that saved $9600. He told the manufacturer the facts of installing a modern Alemite Centralized Lubrication System. That system is in the plant today. The result: assurance of continuous, correct lubrication, few rejects and shut downs, and the addition of a whole hour's production time every working day.

### Call Your Alemite Lubrication Engineer

No matter what size or type of plant you operate, Alemite can show you dozens of ways to save through the more efficient handling of petroleum products. Call your local Alemite Industrial Distributor now or send for the free booklet "11 Ways to Cut Production Costs." Simply attach the coupon below to your letterhead. Dept. C-51, 1850 Diversey Parkway, Chicago 14, Illinois.

*Name on request.

**ALEMITE**

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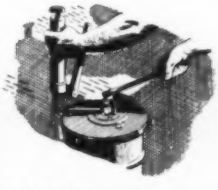
**MEANS EVERYTHING FOR LUBRICATION**

*1. Methods 2. Lubricants 3. Equipment*

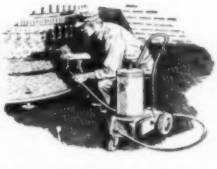
*Another Product of Stewart-Warner*

### *Alemite Cuts Costs 3 Ways*

**1. In transferring lubricants . . .** cuts man hours 63% for every 100 pounds transferred. No mess, no contamination.



**2. In loading grease guns . . .** saves 3¾ man hours for every 100 pounds of lubricant loaded into hand guns.



**3. In applying lubricants . . .** saves up to 23.9 man hours for every 100 pounds of lubricant applied to bearings.

**FREE! Valuable booklet—**
**"11 Ways to Cut Production Cost"**
*(Simply attach to your letterhead)*
**ALEMITE, Dept. C-51**
**1850 Diversey Parkway, Chicago 14, Ill.**

We'll include facts on the new Alemite Oil-Mist System, too—(OIL-MIST atomizes oil into mist, circulates it to bearings under pressure. Increases life of bearings as much as 17½ times).

Name _____

Company _____

City _____ State _____

# This man...

## GIVES 1st AID TO SICK PLANTS!

**The plant doctor** and first aid department look after sick or injured workers, but when a machine or department is threatened with "down time" medical science is helpless while production costs rapidly rise.

But there is a man you can phone, just as you would call the doctor, or the fire or police department, and he will get on the job just as quickly, supplying the parts, materials or knowledge needed.

Emergency cooperation is this man's specialty. He has at hand about every remedy a machine or factory could need for any kind of trouble. He has prepared himself to meet the special requirements of the plants in his locality. Just pick up the phone and call him.

## Capable

"This man" is an industrial distributor* or a specialist in certain industrial items. You will find him listed in the classified section of your telephone book—most likely under the heading Bars, bronze or Bearings, bronze. If he is the leading distributor, he almost certainly is the Bunting Distributor. He carries in stock for your money saving convenience Bunting Standard Stock Industrial Bearings, Electric Motor Bearings, and Precision Bronze Bars—ask him for catalog.

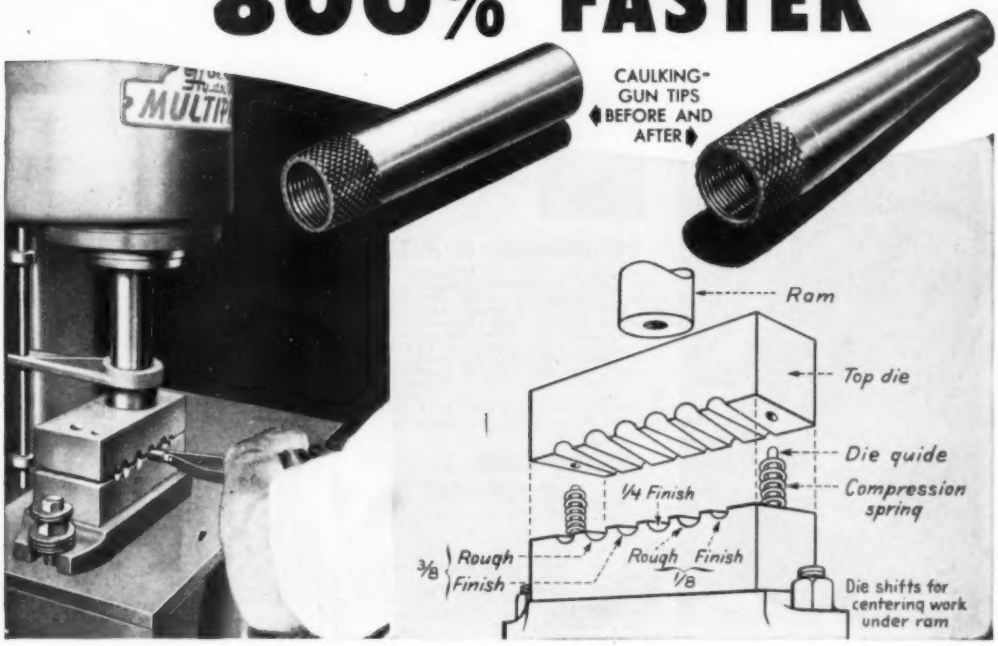
* There are approximately 2,000 Industrial Distributors serving every industrial section of the United States. In 1948 their total sales were more than $3,000,000,000. They carry an average inventory of $500,000,000, turn their stocks 5 to 6 times per year, fill 200,000 orders per day, have 12,000 outside salesmen and engineers, 10,000 inside telephone order expeditors, operate 8000 trucks delivering merchandise on which their average net profit is .0292 cents per dollar of sales.

# Bunting®

**BRONZE BEARINGS • BUSHINGS • PRECISION BRONZE BARS**

THE BUNTING BRASS & BRONZE CO., TOLEDO 9, OHIO

# MULTIPRESS® SWAGES 'EM 800% FASTER




## *Vibratory Control Feature Plays Big Part in Record Production at Crew Manufacturing Co.*

A swaging operation that used to take 3⅓ minutes is now done in *24 seconds* at the Crew Manufacturing Co., Cleveland, Ohio. An 8-ton Multipress makes the big difference.

The job is to taper half-inch tube steel to form caulking gun tips with apertures of ⅛", ¼" and ⅜". Multipress does it faster, gets more uniform results, and has eliminated scrap losses.

Vibratory Ram Action—an accessory available only on Multipress—is a big factor in this amazing speed-up. It delivers short, rapidly repeated strokes of uniform, pre-set pressure, forming the parts in a quick series of easy stages. The operator holds the tubes with inside pliers, and rotates them as he feeds them to the desired depth. Top and bottom halves of the die, separated by compression springs, open slightly between each vibratory ram effort, making it easy to feed the parts.

The die contains both roughing and finishing cavities for all three sizes of parts. It is simply moved to right or left to bring the desired cavities directly under the press ram—no die changes are required.

Worker fatigue has also been sharply reduced by the quieter, easier, oil-smooth operation of the Multipress.

Gains like these are an old story with Multipress, on an extremely wide variety of production jobs. Multipress — an oil-hydraulic tool featuring advanced engineering design—can readily be tailored to your specific needs, in eight different frame sizes, with capacities ranging up to 50 tons. Available accessories include indexing tables, dial feed tables, harmonic stock feeds, straightening accessories, and foil marking attachments. Write today for full details!

A typical 4-ton Multipress equipped with a 6-station index table. Capacities to 50 tons available.

DENISON HydrOILics

**The Denison Engineering Co.**
**1164** Dublin Road, Columbus 16, Ohio

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DOWEL PINS*

Save your time

Where locating to split thousandths is involved you get perfect alignment with fast disassembly and reassembly with Allens — made of heat treated alloy steel and held under a maximum of 8 RMS micro-inch finish.

*Standard either in .0002 or .001 oversize

WARNING
Allen-Type screws aren't necessarily Allen-Made.
Get genuine Pressur-Formed Allen Head screws in this black and silver box.

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A valuable reference for the design of press tools and the fabrication of metals in power presses. This edition includes over 1000 press tool designs, types of presses, attachments and pressroom accessories and tells how to use them in die engineering practice. Tells how to simplify pressework, cut costs, save material, perform difficult operations and improve results. Profusely illustrated treatment shows how to select presses, covers workability of materials, and gives many basic tool designs which can be adapted to a wide variety of specific presswork problems. *Second edition, 543 pages, 524 illus., $8.50.*

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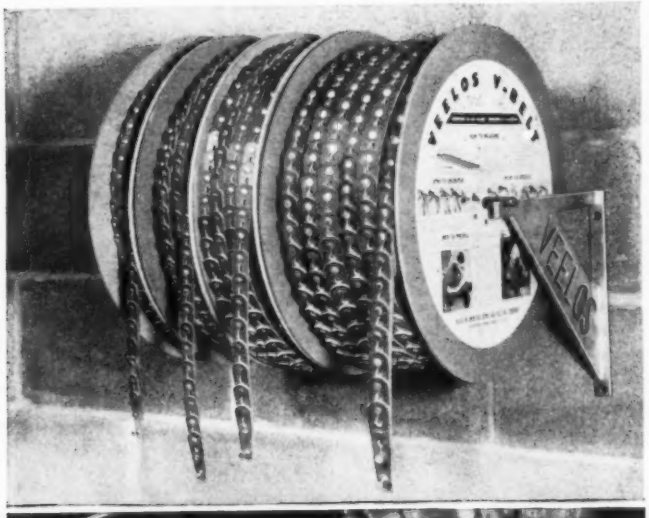


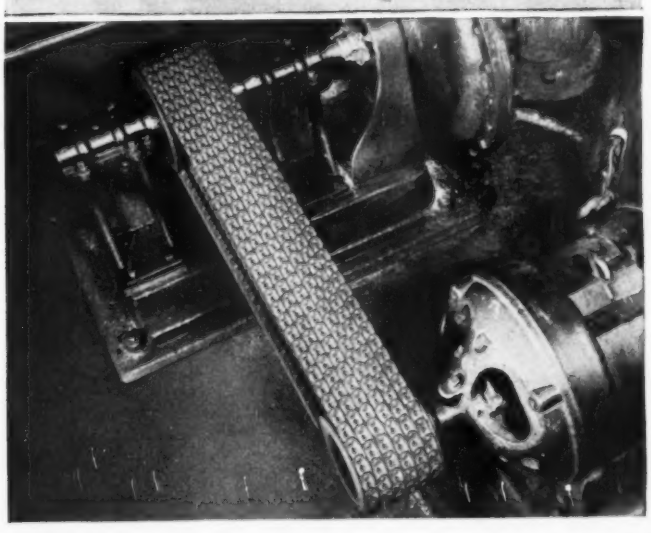

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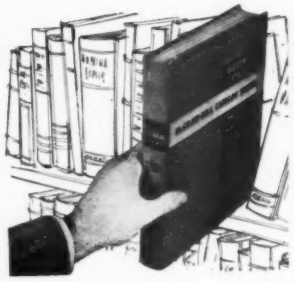

When the need for an electrical product arises in your plant.

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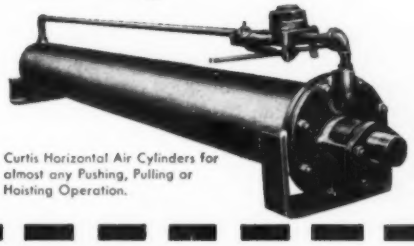

Curtis Horizontal Air Cylinders for almost any Pushing, Pulling or Hoisting Operation.

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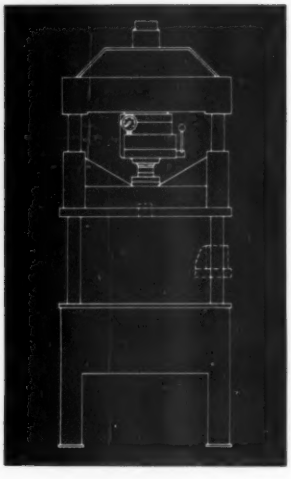
City.....Zone.....State.....

# MATCH DIES *in the toolroom*



## DAKE Die Try-Out Press saves tying-up production equipment

The photograph above shows a specially engineered, custom-built DAKE Die Try-Out Press of 125-ton capacity. Its guided platens assure uniform alignment in testing, enabling diemakers to match dies perfectly before they leave the toolroom.

This press was designed with an air-operated hydraulic cylinder and single-acting piston in the base. At the end of the upward stroke the release valve is opened, permitting the platen to descend by gravity.

The drawing illustrates another DAKE Die Try-Out Press—a 50-ton model with hydraulic workhead above the upper platen. The ram is powered on both up and down strokes.

Either of these presses may also be used for sample or short-run production. If you have a problem which requires development of a special press, it will pay you to communicate with DAKE.

**Dake Engine Company, 636 Seventh St., Grand Haven, Mich.**

DAKE
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PRESSES

Single Leverage

Compound Leverage

Hand-Operated Hydraulic

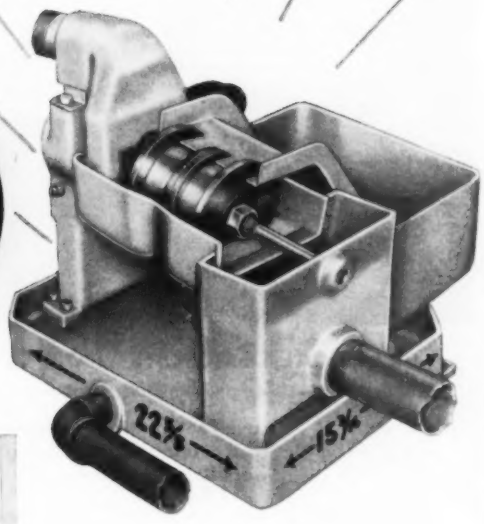
Air-Operated Hydraulic

Elec-Draulic

compact powerful

small

amazing **new** HOUDAILLE **magnetic filter** for Coolants and Cutting Oils




- **Takes up no more space than a drinking fountain . . . yet**
- **Does a king-sized job! Removes 98% of contamination from coolants and cutting oils!**

New Houdaille Magnetic Filter is completely automatic . . . uses no filter bags or cartridges . . . requires no attention. Trouble free! Simple design, rugged mechanism requires no maintenance. Nothing to get out of order.

Ideal for individual machines of all types, such as: grinders, milling machines, gear shapers, drilling machines, etc.

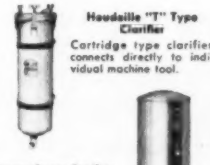
***Write for new bulletin describing the compact, powerful new Houdaille Magnetic Filter, TODAY!***

### Coolant Filtration Cuts Rejects, Reduces Downtime

Liquid coolants used for grinding and cutting operations must be kept free from metallic and abrasive contamination . . . otherwise grinding wheels become loaded and cutting tools are quickly dulled. Excessive rejects and machine downtime are the usual penalties imposed by contaminated coolants. Continuous filtration . . . *before* the coolant flows over the work . . . results in longer tool and wheel life, better finishes, fewer rejects and less downtime. Coolant use is greatly extended and man-hours are saved by eliminating periodic sump cleaning.

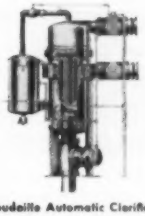
***Write for Engineering Bulletins and Case Histories on the filtering of coolants and oils used in metal-working operations.***

With the addition of the new Houdaille Magnetic Filter Honan-Crane now offers a *complete line* of the finest clarification, purification and handling equipment available for metal working oils and coolants. Write for descriptive literature, stating type of problem involved.



**Houdaille "T" Type Clarifier**
Cartridge type clarifier connects directly to individual machine tool.

**Honan-Crane Purifier**
For complete purification through use of cellulose fibre and Cranite (fuller's earth).



**Houdaille Automatic Clarifier**
For clarification of oils and coolants in large volume, central systems.

**Houdaille Mobile Coolant Filter**
Cleans coolant sumps without interrupting production. Easily handled by one man.

**Houdaille Sump Cleaner**
For sump cleaning and manual transfer of oils to and from clarifier or purifier.

CLEAN OIL ENGINEERING

**HONAN-CRANE CORP.** 205 WABASH AVE., LEBANON, INDIANA

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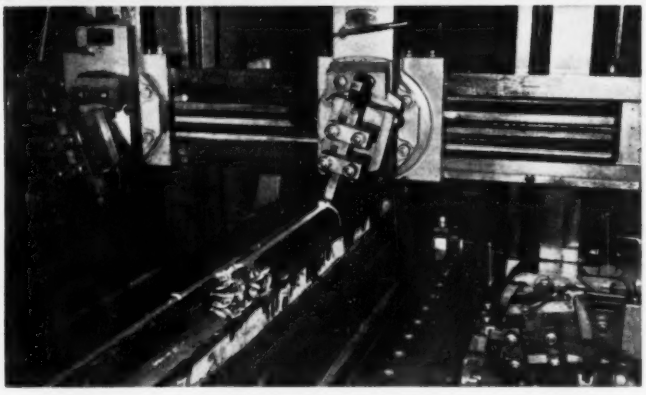
## *There's a Walker Magnetic Chuck for Every Known Application . . .*



**PRACTICAL DEMONSTRATION OF POWER**

Walker Chuck, without supporting back rest, holds tremendous pressure.

*Walker Chucks* save setup time, eliminate need for costly and time-consuming clamps and work-holding fixtures.

*Walker Chucks* Also Permanent Type now available in the following sizes:

| RECTANGULAR | | | SWIVEL | ROTARY |
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| 4″ x 8″ | 6″ x 18″ | 10″ x 15″ | 4″ x 8″ | 4″ 12″ |
| 5″ x 10″ | 8″ x 18″ | 10″ x 24″ | 6″ x 18″ | 6″ 14″ |
| 6″ x 12″ | 8″ x 24″ | 12″ x 24″ | 8″ x 24″ | 9″ 16″ |
| | | | | 10″ |

*Hold Everything with Walker Chucks*

**O. S. WALKER CO. Inc.**

WORCESTER 6, MASSACHUSETTS

*Original Designers and Builders of Magnetic Chucks*

*Precision Die Made—Lowest Possible Cost.*

**DAYTON ROGERS MFG. CO., Minneapolis 7, Minnesota**

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**PRESENTS THE NEW**

**"LEADER"**

***CHROME-CLAD***

**STEEL TAPE**

- New rich maroon *Vinylite* covered case—protection against water, stains, and scuffs.
- New recessed winding device is flush with case; attractive new bushing plates.
- Maximum rust-resistance with stainless steel edge band and nickel plated fittings.
- Famous *Lufkin Chrome-Clad* finish on tape line gives non-glare readability . . . will not chip, crack, peel, or corrode.

If you're buying steel tapes with an eye to the future, you'll get the long-lasting measuring service and satisfaction you want by specifying the durable wear-defying *"Lufkin Leader."* A beauty with brawn, its tough, attractive *Vinylite* covered case protects against rough and steady usage . . . its rust-resistant stainless steel edge band and nickel plated recessed winding device assure years of corrosion-free operation.

Even the jet black markings of the *Chrome-Clad* line are protectively recessed below the chrome-white surface making them easy-to-read and *durable.*

The "Leader" is marked one side only in feet, inches, and 8ths—has "Instantaneous" Readings. Available in 25, 50, 75 and 100 foot lengths with or without hook ring. Ask your Dealer or Distributor to show you a new *Lufkin "Leader"* . . . you'll find it to be exactly what you want in a long steel tape.

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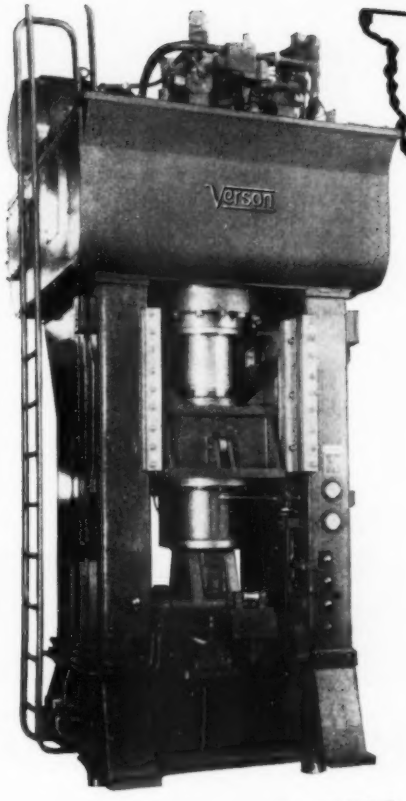
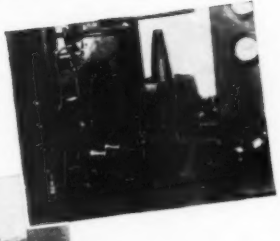



*The Verson method of nosing projectiles . . .*

# THIS TRADE Verson MARK AUTOMATIC TOOL-UP noses 150 155 mm. shells per hour



*The shell ready for the nosing operation is automatically conveyed to the front of the press and into the open die pot (right) which then closes . . .*

*. . . and remains closed during the press stroke. After nosing, the die pot opens at the back (left) and the shell is conveyed away from the press.*

OUR long experience in high production press working of metal may prove of value to you in tooling for armament and war material production. The engineering skill we have gained over a period of years is already being used to develop new and more efficient means of producing the implements of defense.

Tool-ups under way prove that it is possible to conserve substantial quantities of manpower, raw materials and time wasted in methods that do not exploit to the fullest the recent advancements in the press working of metal.

Whatever your requirements, from a single press to a complete tool-up we'll be happy to go over them with you. Write for additional information, outlining the nature of your needs.

**Originators and Pioneers of Allsteel Stamping Press Construction**

## VERSON ALLSTEEL PRESS COMPANY

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MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING
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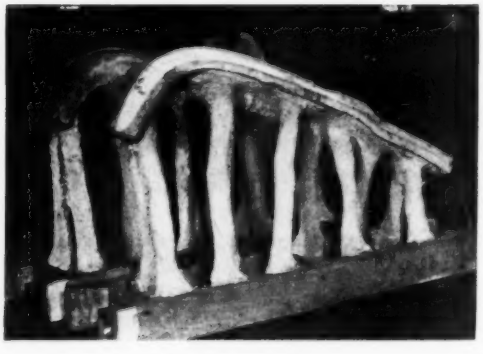
WOODEN BOXES and CRATES
CORRUGATED FIBRE BOXES
BEVERAGE CASES
STARCH TRAYS - - - PALLETS

**RATHBORNE, HAIR and RIDGWAY BOX CO.**
1440 WEST 21st PLACE • CHICAGO 8, ILLINOIS


## Did You Identify this Picture on Page 231?



It's a master pattern for a bumper die, ready for Kellering at Allied Products Corporation. A "close-up" of die-making or *any* manufacturing methods in Allied's five modern plants illustrate the combination of skill and facilities that turn out consistently fine products.


# KEYSEATING
## The Modern Way

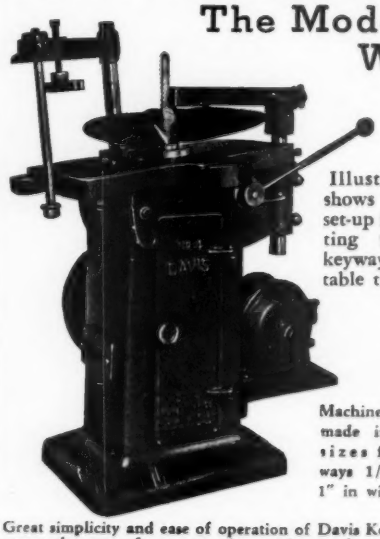


Illustration shows typical set-up for cutting taper keyways with table tilted.

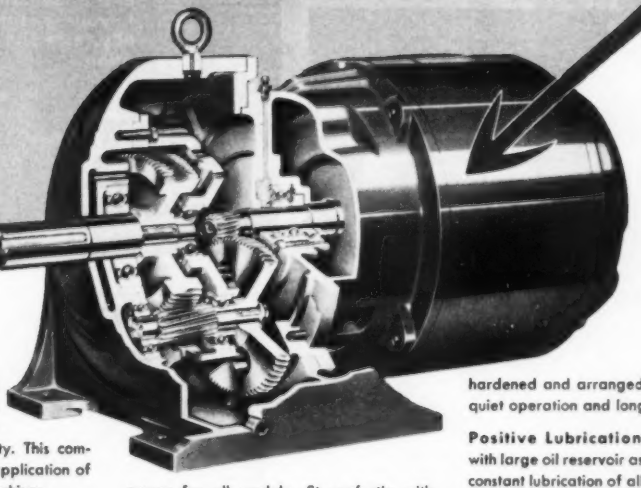
Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.
*Let our engineer study your keyseating problems.*

**DAVIS KEYSEATER COMPANY**
**403 EXCHANGE ST. ROCHESTER, N. Y.**

# For SLOW SPEED Output with HIGH SPEED Motor Efficiency

## PHILADELPHIA GEAR MOTOR



**Compact Design**—Design conserves space to greatest extent possible without sacrifice of strength or accessibility. This compactness simplifies the direct application of electric drive to individual machines.

**Balanced, Integrated Dynamics—For Strength**—Design of gear unit in the higher ratios lends triangular stability based on Balanced, Integrated Dynamics. High grade grey iron cast frame gives added strength and shock resistance.

**Precision-Built Motors**—Precision-Built A-c and D-c Motors provide dependable power for all models—fit perfectly with gear unit.

**Simplified Assembly**—Motor and gear unit, each self-contained, are readily separated; gears in multi-reduction units may be inspected without uncoupling from driven machine.

**Quiet, Long-Lived Gears**—Helical gears are alloy steel—precision-machined, wear-hardened and arranged in simple train for quiet operation and long life.

**Positive Lubrication**—Splash system with large oil reservoir assures thorough and constant lubrication of all parts of gear unit. Leak-proof housing. Motor, greased independently, has double-shielded ball bearing design.

**Unlimited Adaptability**—Available in single, double and triple reductions to provide a wide range of speeds with motor ratings from 1 to 60 hp. NEMA "D" type flange mounting permits use of any type enclosure in A-c or D-c motors.

*Send for new 42 page illustrated catalog GM-48, containing full information and data necessary for ordering, and please use your Business Letterhead when requesting same.*

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GEAR ECONOMY BEGINS WITH **BRAUN**

The Braun Gear Company has been shaping the wheels of industry for more than 38 years, producing gears of quality at economical prices. Braun's brand new plant is now more than ever equipped to supply the things that count in gears—precision workmanship, fine materials, good design, and prompt service.

Send samples or prints and specifications for immediate quotations. Whether your requirements are for one gear or thousands, you will find that economy begins with Braun!

**BRAUN GEAR COMPANY**
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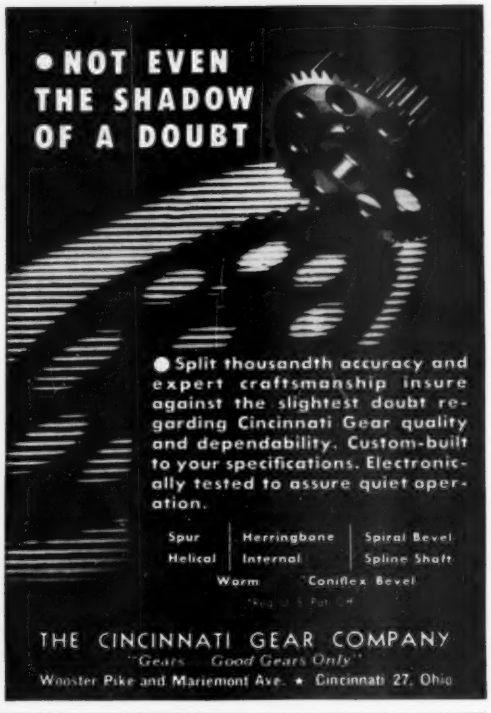

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● Split thousandth accuracy and expert craftsmanship insure against the slightest doubt regarding Cincinnati Gear quality and dependability. Custom-built to your specifications. Electronically tested to assure quiet operation.

Spur | Herringbone | Spiral Bevel
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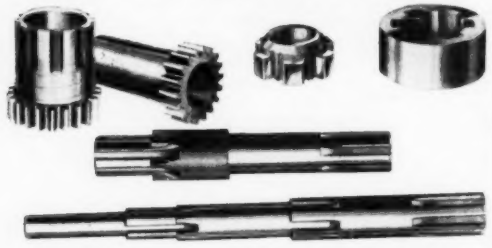
**If you use GEARS...**



Regardless of quantity or type, you'll profit by specifying Adams custom made gears for your product. Made on the most modern gear cutting machines, Adams gears are quality controlled to guarantee exact conformance to your specifications. Write for details.

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**Dubuque, Iowa, U. S. A.**
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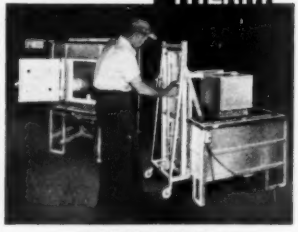
FINE GEARS MADE TO YOUR SPECIFICATIONS

*Your Heat Treat Line Needs* **CONTRO-THERM** for HIGHER OUTPUT in LESS TIME

A small, compact, inexpensive unit.



**VERSATILITY** • CONTRO-THERM PROCESS permits superior results on all types of heat processing, both with normal furnace atmosphere and additive or foreign atmospheres.

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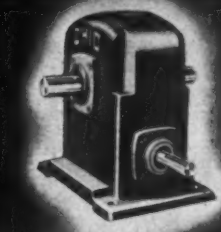

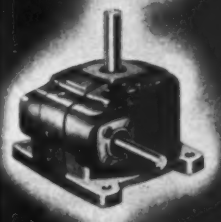

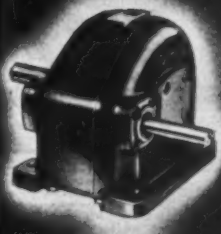

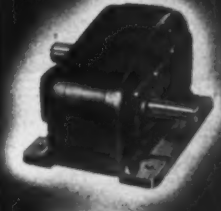

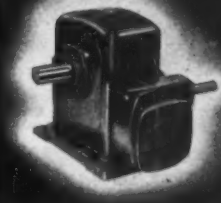

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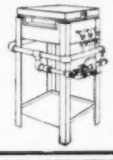

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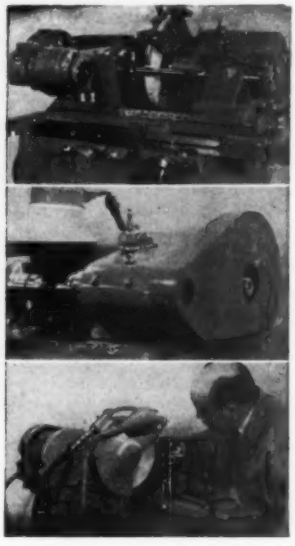

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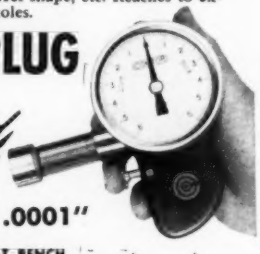

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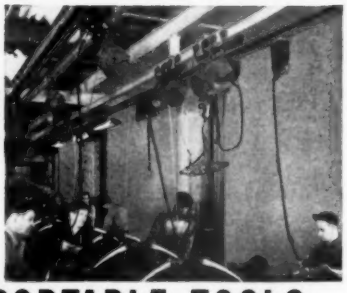

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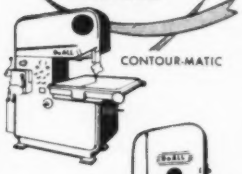
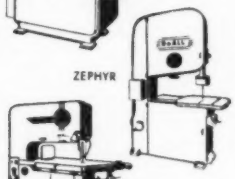
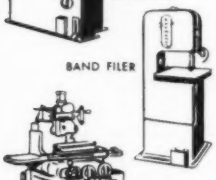
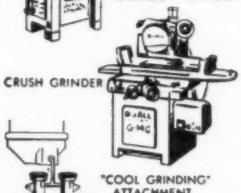

CONTOUR-MATIC

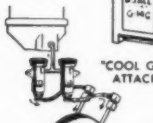

ZEPHYR

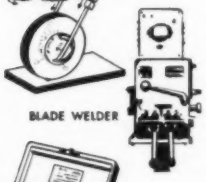
CONTOUR


BAND FILER

TOOLROOM GRINDER


CRUSH GRINDER


"COOL GRINDING" ATTACHMENT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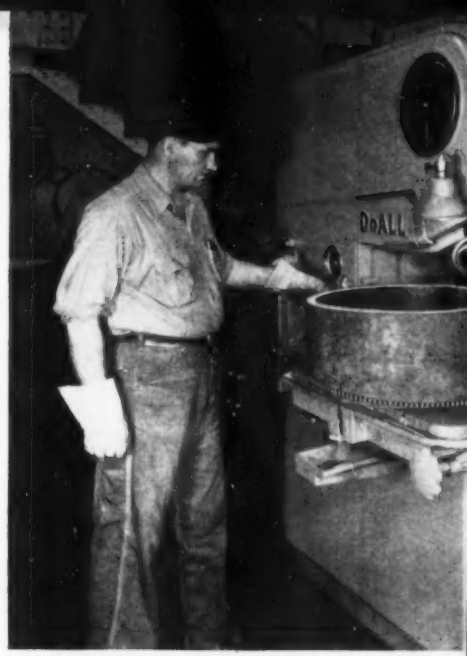

National Acme Company, Cleveland, reduces cost of cams and gears. One of the first steps in production of Acme cams is splitting the ring shown above into segments. DoALL MP-20 makes cut through 9¼ x 1⅛" wall thickness in three minutes.

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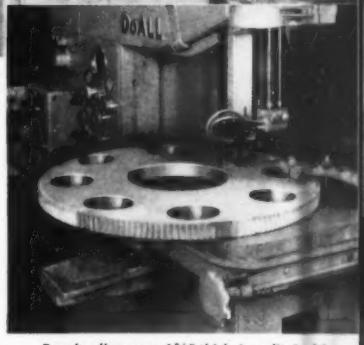
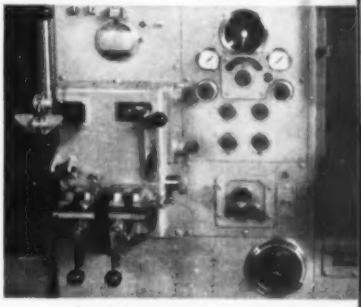


Tough alloy gear 1¾" thick is split in 16 minutes "floor to floor time." MP-20 provides required band speed and feed pressure.


Centralized operating panel controls speed of tool, feed pressure of table, welding the tool, and coolant facilities.

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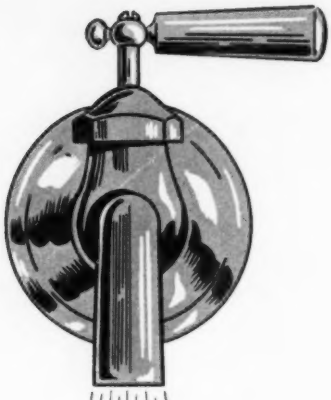

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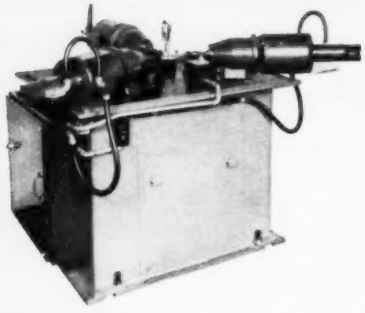

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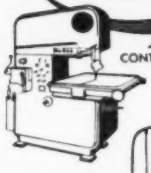
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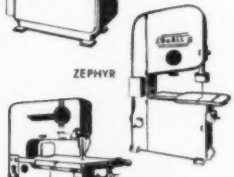
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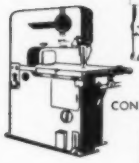
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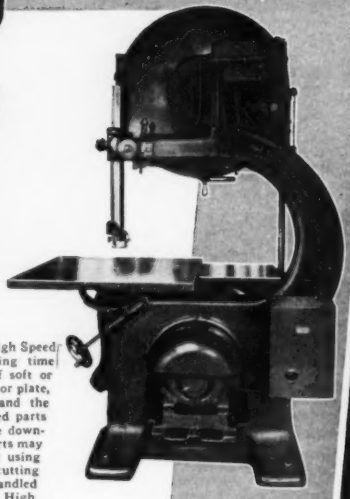

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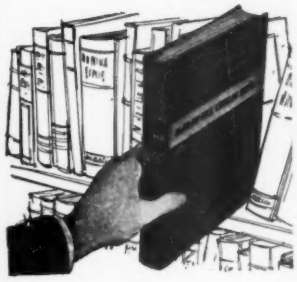

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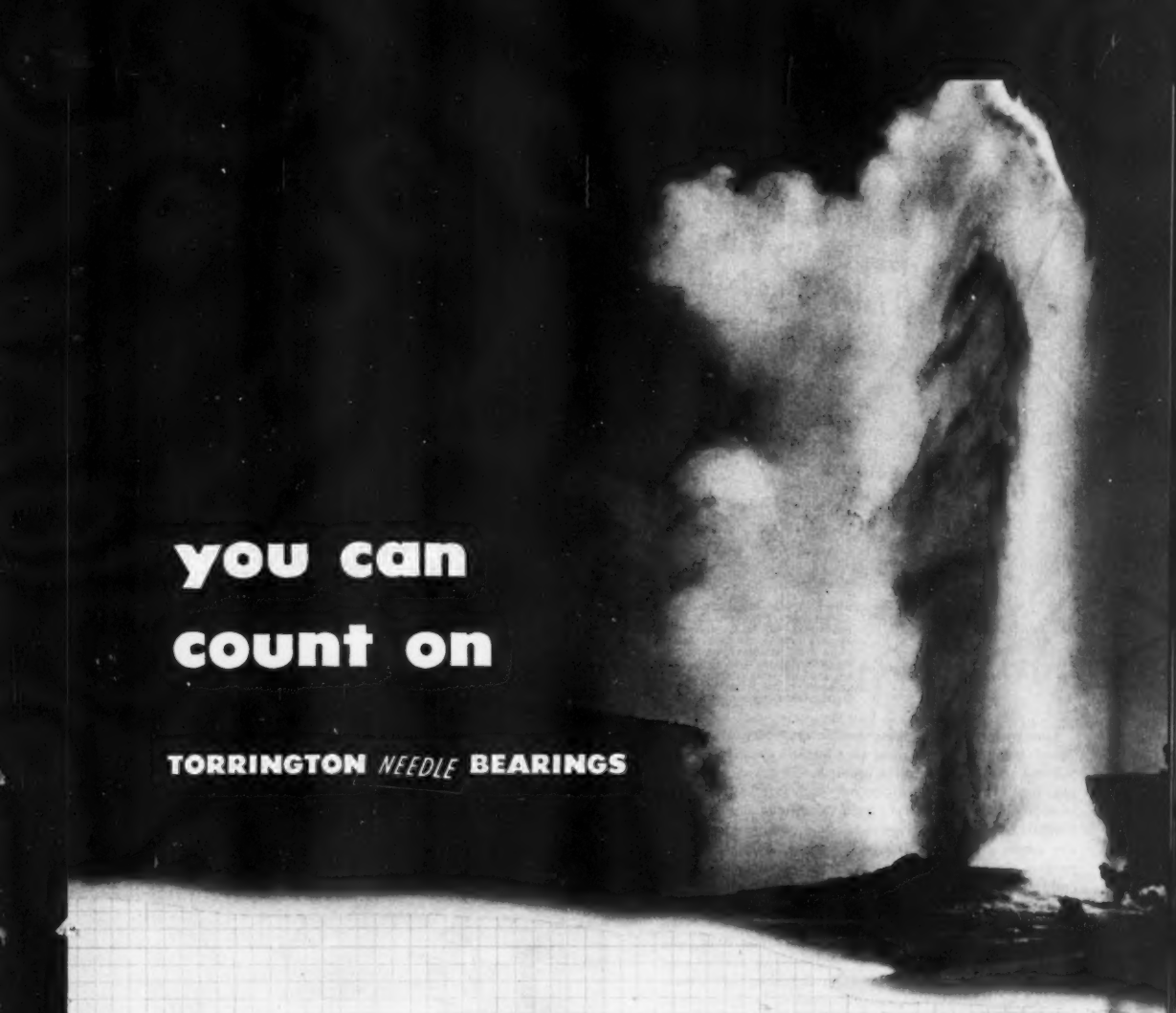

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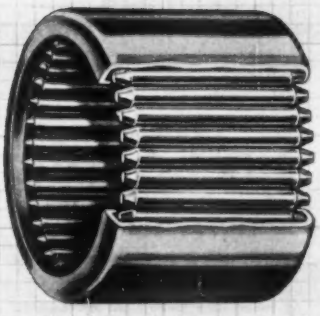

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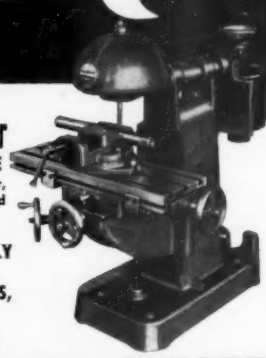

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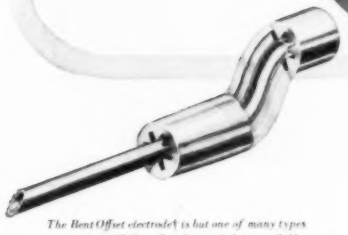

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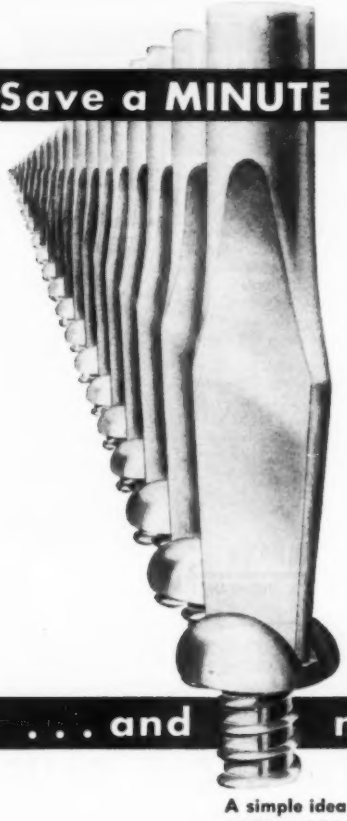

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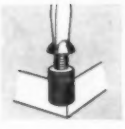

MACHINE SCREW IN THREADED INSERT

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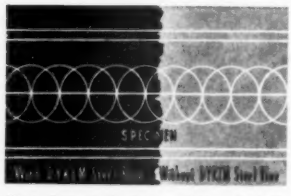


Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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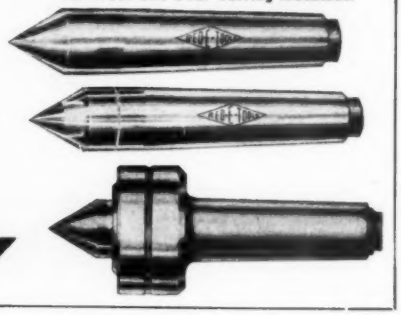

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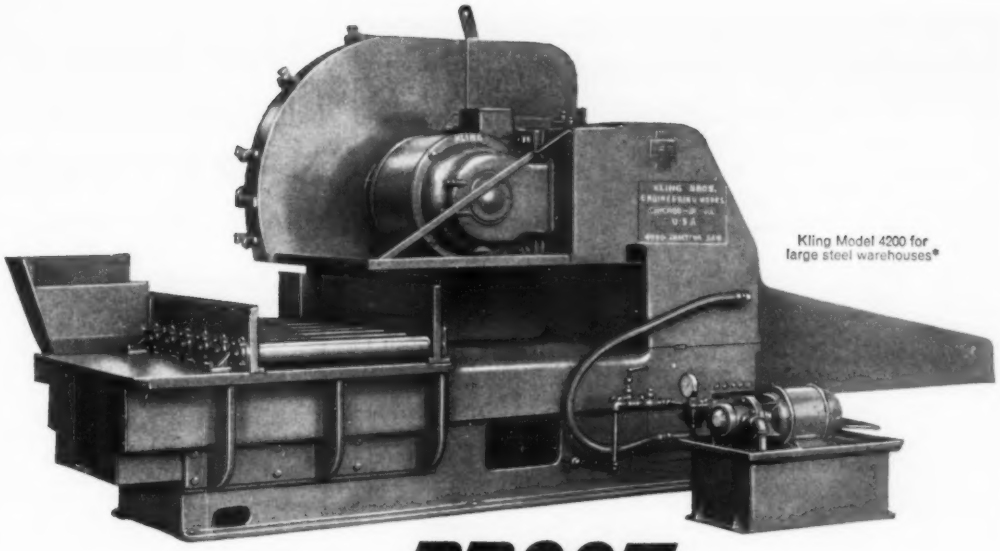

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### What is friction sawing?

It's a proven method of cutting metal by generating heat through friction on the part to be cut at a rate faster than that part can absorb heat. This temperature increase reduces the tensile strength of the piece to the point that the weakened surface can no longer resist the action of the colder blade. The metal is thus easily removed with no apparent wear on the blade surface.

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Cuts all types of steel, hard or soft, big or small, in any shape, without distortion. For day-in, day-out production, one Kling Friction Saw will do the volume of work that would ordinarily require several separate shears or slow speed saws. One of the big time-saving reasons is the ability of the Kling Friction Saw to cut any structural shape, without change of blade or setup. Because the average Friction Saw blade will give a good full day's production before requiring redressing, you eliminate costly downtime and also save on tool costs.

### FREE complete, friction sawing information!

*Learn how you can profitably apply Kling Friction Sawing in your plant. The information contained in this 12-page bulletin will give you the complete story on Friction Sawing . . . including the principles of the process and some of its applications. Write today for your FREE copy.*

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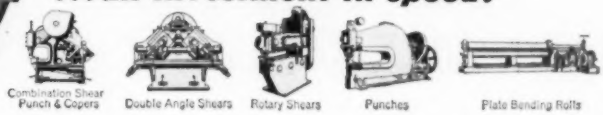
| How long would it take you to cut these pieces? | With a Kling friction saw you could do it in approximately . . . |
|---|---|
| 24" 100 lb. I Beam | 28 seconds |
| 15" 55 lb. Channel | 15 seconds |
| 8"x8"x34.3 lb. H Beam | 10 seconds |
| 100 lb. A.R.A. Rail | 9 seconds |
| 6-1/2"x6-1/2"x19.8 lb. Tee | 5 seconds |
| 8"x8"x3/4" Angle | 11 seconds |
| 3" Square | 10 seconds |
| 4" Round | 15 seconds |
| 6" O.D. Tube, 1/2" Wall | 11 seconds |

5391

*What's your requirement? There's a size to fit your specific needs—large or small.

# Kling ...an investment in speed!



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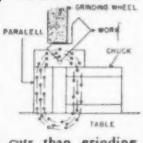
## When You Consider Magnetic Chucks Look for Deeper Magnetic Penetration

**. . . And Include Tough Holding Jobs Like This**

This principle of applying magnetic power to holding work for machining operations makes it possible to hold work that can not be held successfully with other types of magnetic chucks. Unusual shapes, as indicated in the sketches at the right, are easily handled with Sundstrand Power-Grip Chucks.

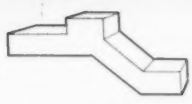
### Why You Can Hold Tough Jobs and Take Heavy Cuts with SUNDSTRAND Magnetic Chucks



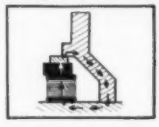

The sketch at the right illustrates the ease with which "V" blocks can be set up and held for accurate grinding. Note the deep penetration of the magnetic field through the part and machine table. Heavier cuts than grinding can be handled easily in this same set-up. It's this deep magnetic penetration, rather than flimsy surface contact, that will allow you to do more work, take heavier cuts.

### Get Complete Facts *FREE*

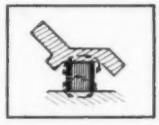
There's a lot more to this Sundstrand Power-Grip method of holding work. Be sure to have all the facts. Write today. Ask for bulletin 107-M.



This part is used as an illustration of the wide set-up possibilities of Sundstrand Power-Grip Chucks. Note in the sketches below the four different positions in which the part is held.

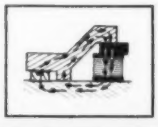


Parallel on top of chuck and steel block added to support work for squaring top with bottom.



Note two circuits, one holding piece on chuck while other holds chuck to table.

A simple arrangement is used to square the piece in this position. No parallel is needed, because the piece carries the flux to complete the circuit.



Parallel on top of chuck to square upper end of piece. Block under extended part acts as support and carries additional flux.

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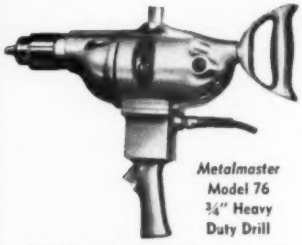

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¾" Heavy Duty Drill

**Capacity:** ¾" in steel; 1½" in hardwood
**Speed:** No load 425; full load 260 rpm.
**Chuck:** 3-Jaw Jacobs key-type
**Weight:** Net 24 lbs.

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De-burring and finishing metal parts by tumbling with chips and compounds in specially designed machinery is a relatively new process. This technique was initially developed just prior to World War II, and was designed primarily for finishing parts preparatory to plating. The effects of chips and compounds on different metal parts were studied through a trial and error effort. Surprisingly good finishes were obtained which could be duplicated uniformly.

Successful grinding and finishing were performed on steel, brass, aluminum, stainless and nickel steels—on castings, forgings, stampings, and machined parts. Uniformity on quantity lots was attained from severe grinding to fine finishing. Likewise, a more uniform surface finish was obtained and dimensions were held to close tolerances. Besides producing a superior finish on most work, the process indicated tremendous savings in direct labor.

**Tumbling Aids World War II Production**

It was at about this same time that manufacturers became occupied with defense, and, shortly later, war production. Tumbling was a natural answer to the extreme demands put upon producers to step-up de-burring operations. The faster tempo of increased manufacturing could not be satisfied by old fashioned, hand applied methods. Tumbling with chips and compounds broke this bottleneck, because it could do the job not only faster with less labor, but could do it as accurately or more so than by hand. Standardized procedures were established, based on the experience of using certain types and sizes of chips, and various compound preparations on different kinds of metal parts. Savings were made over hand methods by as much as 80% on work for aircraft, electronic, naval, munition, and military vehicle production.

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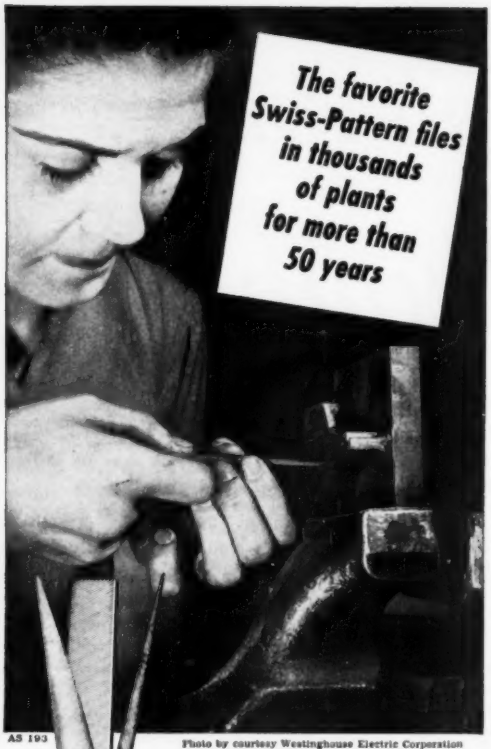


AS 193

Photo by courtesy Westinghouse Electric Corporation

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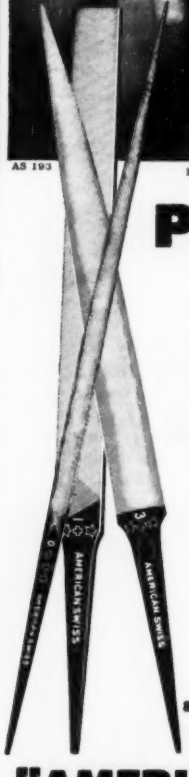


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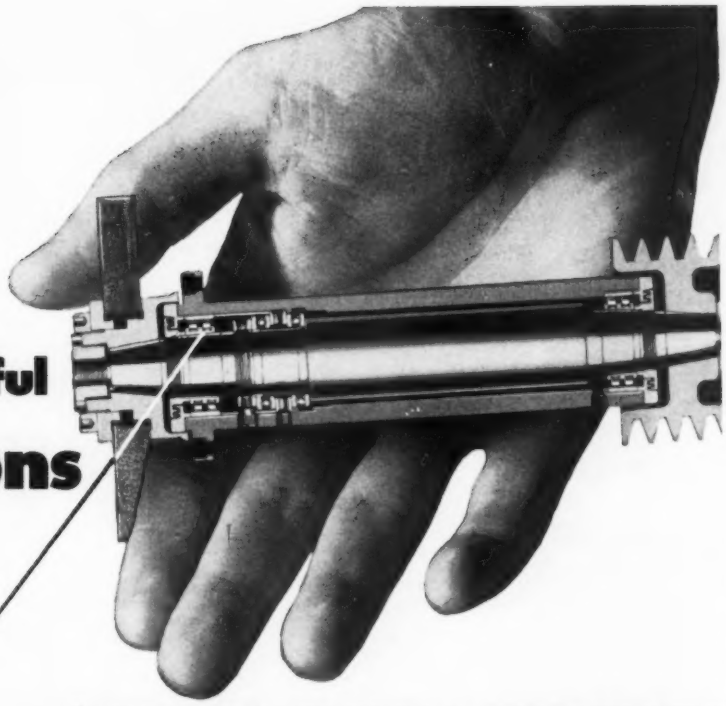

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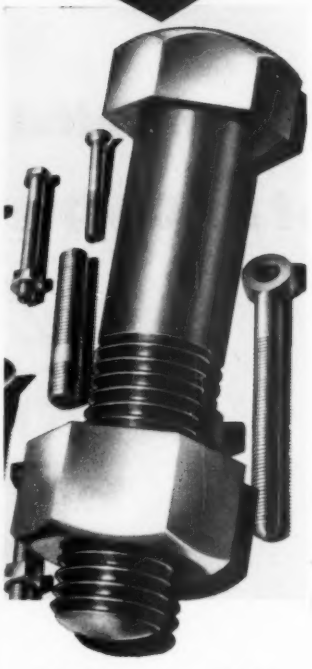

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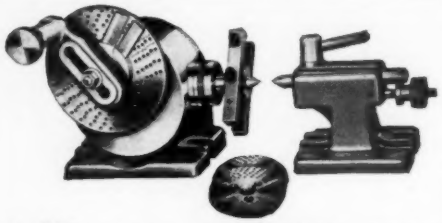

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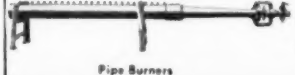

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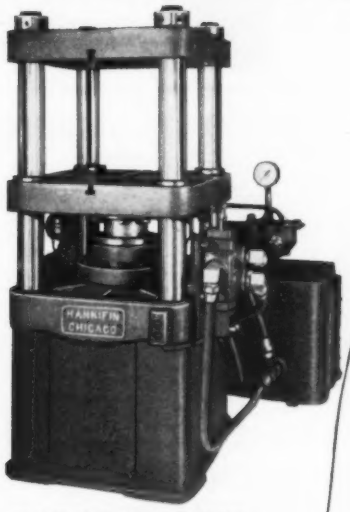
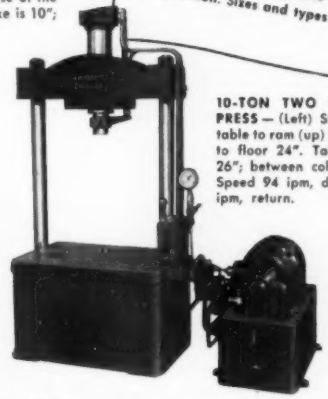
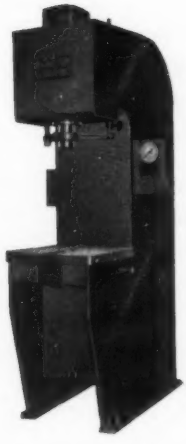



**75-TON FOUR COLUMN PRESS** — (Above) In this compact design, the cylinder is located in the base of the press below the platen. Stroke is 10"; 36" x 30" between columns.



**10-TON TWO COLUMN PRESS** — (Left) Stroke 12"; table to ram (up) 30"; table to floor 24". Table depth 26"; between columns 30". Speed 94 ipm, down; 118 ipm, return.



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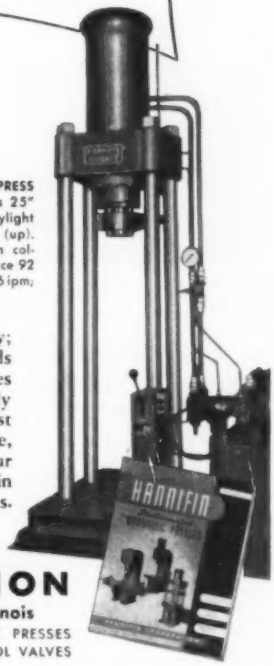


**50-TON FORCING PRESS** — (Right) Features 25" stroke with 60" daylight from table to ram (up). 18" x 8½" between columns. Speed: Advance 92 ipm; Power Stroke 26 ipm; Return 130 ipm.

THE advantages offered by hydraulic presses are many; for the best, specify "HANNIFIN"! Hannifin builds more than 75 standard models in a range of capacities from 1 ton to 150 tons. Hannifin designs are readily adaptable to modification at minimum expense. In most instances, clearance, gap, stroke, speed, size of table, and type of control can be changed easily to meet your particular requirements. For recommendations, call in your Hannifin field engineer or submit specifications.

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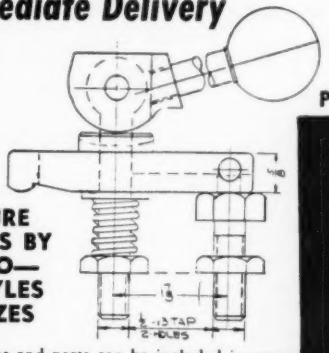


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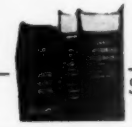

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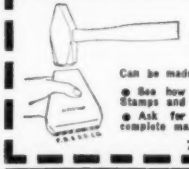

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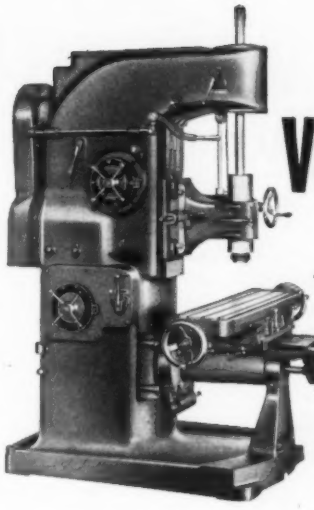

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## From the *American Machinist* Library of Tips for Top Shop Men

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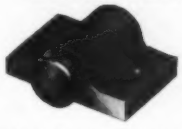

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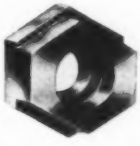

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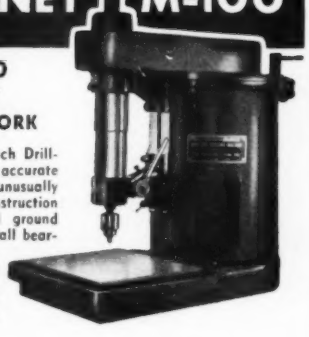

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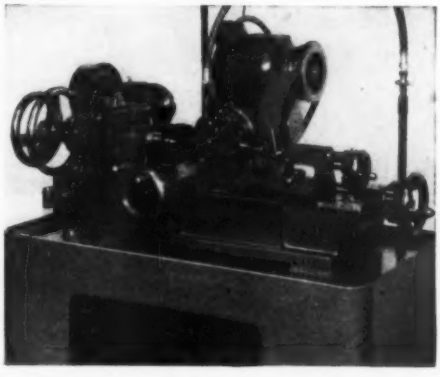

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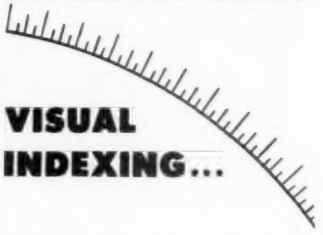

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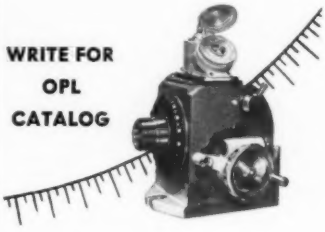

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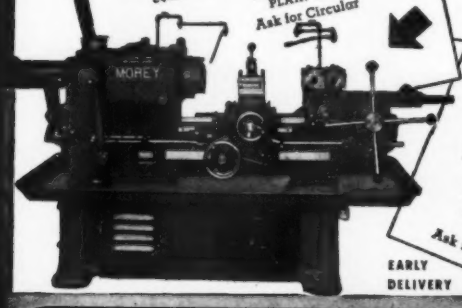

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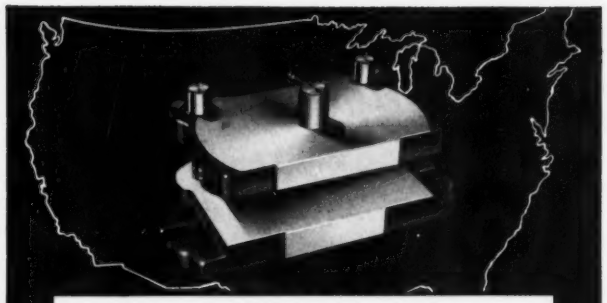

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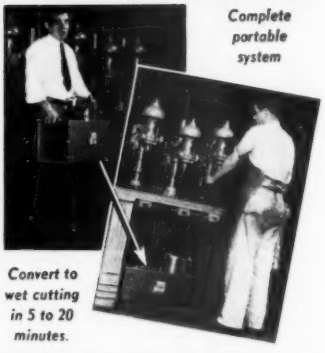

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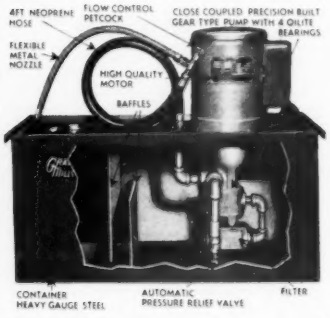
*Convert to wet cutting in 5 to 20 minutes.*

It pays to use the new, husky Graymills Coolant systems and pumps to convert machines to wet cutting for replacement or as standby units. They increase cutting speeds, improve work quality . . . Most industrial distributors stock standard units.




Sturdy high pressure gear models . . . smooth high volume centrifugal types in 1/25 to ½ HP ratings, 1 gal. to 70 g. p. m. with tank capacities from 5 to 38 gals. Also immersion type centrifugal pump and motor units.

*WRITE FOR NEW CATALOG TO—*

GRAY MILLS

GRAYMILLS CORPORATION
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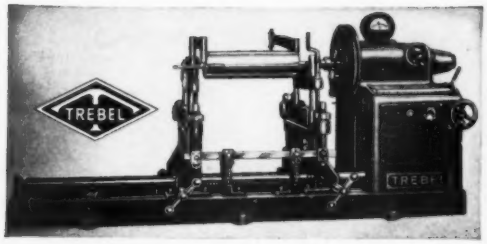
## From the *American Machinist* Library of *Tips for Top Shop Men*

DON'T flaunt your greater income or privileges before your subordinates. No matter how much they like you, their resentment and envy will do you more harm than the flaunting does your ego good.

REMEMBER that human problems need careful study just as do engineering problems. Man is multi-motivated and one prescription won't cure all his ills.

BE suspicious of any figures you hear, and of most of those you see. If they don't correspond immediately to your previous experience, check 'em before you quote or use 'em. The urge to make numbers bigger, or smaller than anything previously reported is overpowering to some people; don't be victimized.

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FOR the rapid determination of unbalances of rotating test pieces of all kinds and compensation in any two planes. Sensitivity of machine may be regulated during balancing. Accurate, direct readings without calculations, graphs or tables in 20 to 40 seconds.

Available for test pieces from 100 grams to 6 tons.

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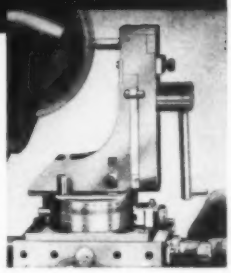
# More Production per Man Hour with Machine Shop TIME SAVERS

*by J&S.*



**J & S "Fluidmotion" RADII and ANGLE DRESSERS** dress **entire** angle-radius-angle **profile in one continuous motion**—with one easy set-up! Automatic centering, dust-proof and chatterless, high-carbon, high-chrome steel construction. Dresses wheels up to 20" diameter —easily **adaptable** to all surface and cylindrical grinders, with J & S fixtures.

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**J & S "Down-Hold" VISE JAWS and "Attachable" PARALLELS,** used with regular vises, save 25% to 75% on loading time! VISE JAWS force work-piece down—"stops" provide accurate position. **Eliminate** hammering, feeler gauges, allow repetitive operation. PARALLELS snap into place, are forced down so chips can't get under them. **Eliminate** wiping vise and parallels after each operation. Both Vise Jaws and Parallels easily attached to any type and size machine vise.

***Also: J & S "All-Purpose" JAW CLAMPS (see center photo) for quicker set-ups, better grip; J & S Form Grinding Service—special tools to specifications.***

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## *Forming and Drawing* Dies
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Stringers for aircraft wing sections are formed from flat sheets of aluminum alloy with *Hi-Den Dies* on a press brake.

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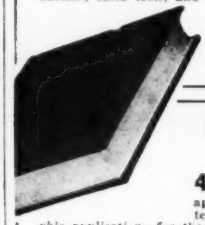

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Operations essential to investment casting are clearly explained by two experts in *American Machinist's* Special Editorial Report, "Investment Castings Depend on Good Pattern Tooling." The authors discuss the latest aspects of pattern tooling from considerable experience, and discuss examples of both good and bad practice.

Filled with instructive photographs, copies of this 12-page report are available at 20¢ each. Write to Reader Service Department:

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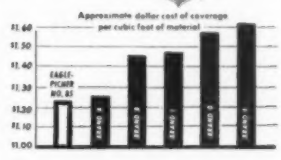
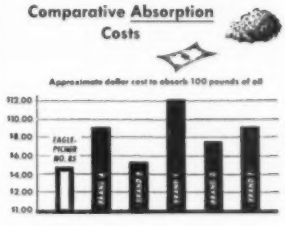
**Comparative Coverage Costs**




**Comparative Absorption Costs**

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This line of small size end mills, in both double-end and single-end, with flutes shorter than regular, provides the following advantages:

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*** An actual case history from the Allis-Chalmers Pittsburgh Works, manufacturers of Transformer Radiators.**

At Allis-Chalmers, well-known manufacturer of industrial equipment, the problem was to secure a satisfactory oil pressure test on transformer radiators. The key to the problem was to find a brush narrow enough to clean between cooling fins and strong enough to remove slag and spall on welds which could conceal pinholes. Pittsburgh engineers recommended an 8" rotary wire brush. The brush proved more than satisfactory and the problem was solved!

***Let Pittsburgh Engineers Solve Your Brush Problems.***

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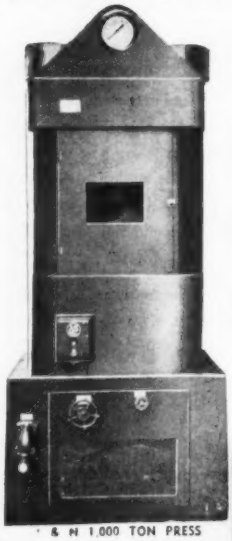
## From the *American Machinist* Library of *Tips for Top Shop Men*

GET to know your people *before* you have to get tough with 'em. It's poor policy to make their acquaintance by bawling 'em out. Introduction by insult is no longer a successful management routine.

THE old Army slogan, "If it moves, salute it; if it doesn't, pick it up; if you can't pick it up, paint it," can well be adapted for plant use by changing "salute" to "guard" and "paint" to "oil."

# HOBBING PRESSES
## are BETTER — *BUILT BY M & N!*



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Capacities from 100 to 2,000 tons

1 **ECONOMICAL** Low initial cost and low operating costs make M & N Hydraulic Hobbing Presses outstanding performers in the hobbing field.

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**M & N Presses are outstanding in performance—outstanding in production!**

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ON reaming and other circular cutting jobs in the plant is where Staples reputation for quality is made and proven.

On job after job, Staples Carbide-Tipped Expansion Reamers and other circular cutting tools boost output per tool and per hour while maintaining close tolerance and maximum precision.

Ask for a demonstration in your plant of how the exceptional performance of Staples Carbide-tipped Tools will give you higher production and lower costs.

**THE STAPLES TOOL COMPANY, Cincinnati 25, Ohio**
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The time it takes to read all the ads is time well spent. One ad alone can pay off—by informing you of new developments and new sources of supply, by helping you do a more efficient job. For example, you may locate one machine that will cut your production costs, or step up your output. Or you may discover that the equipment you've been waiting for is now available.

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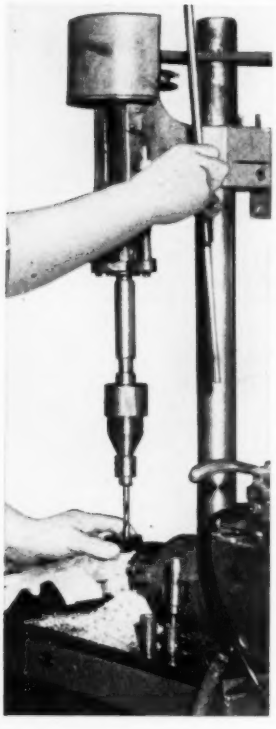
DRILL & TAP CHUCKS

## From the *American Machinist* Library of *Tips for Top Shop Men*

SLAVERY was not abolished by Lincoln. He did end physical slavery, but man himself must end mental slavery to habit. Education will help, but the real problem is to breed a race of open-minded, inquiring men who welcome the chance to wonder, to question and to analyze—then to take a chance on a new idea that looks sound.

PROCEDURE for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.

## High Production...Low Cost at Remington Rand with Wahlstrom Automatic Chucks



"Our drilling and reaming are performed with a single-spindle drill press, through use of the Wahlstrom Automatic Chuck," reports A. Dressler, Production Manager of Remington Rand Inc.'s Elmira plant. "With Wahlstrom Chucks, cutting tools are changed in seconds while the drill spindle is running... giving us high production at low cost."

You, too, will find that *one spindle does the work of several* when you use AMF Wahlstrom Automatic Chucks. Save tool-change time in drill press work...spotting, reaming and drilling in jig borers and millers...in lathe work for burring, turning and filing.

Wahlstrom Chucks—the only *fully-automatic* drill chucks holding widest range of straight-shank tools. Available in Model A—$\frac{1}{32}$" to $\frac{1}{2}$"...Model AA—$\frac{1}{64}$" to $\frac{3}{8}$"... Model B for larger straight-shank tools... Model C for taper-shank tools and fully-automatic tappers.

*See your local distributor or write for Bulletin 56-5.*

AMERICAN MACHINE & FOUNDRY CO.
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amf *fully automatic*
**CHUCKS**

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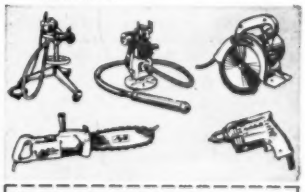
## More Screws Set With Uniform Tightness

## Mall single slip clutch adjusts screw tension automatically

We'll prove it in your plant. Here's a screwdriver that controls selected screw tension for you. Clutch automatically "slips" to assure the same tightness for every screw. Eliminates stripping screw threads or breaking studs. Adjust clutch tension without dismantling. Constructed of lightweight aluminum alloy. Easy to handle in hard-to-get-at places. Two finder-type bits furnished.



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*Manufacturers of over 1000 Tools for a Million Jobs*


## From the *American Machinist* Library of *Tips for Top Shop Men*

EVERY time you try something new, somebody will call it "a dangerous precedent." Remember that everything new is either wrong or a dangerous precedent to the timid. If you let such reasoning sway you, you'll never do anything new. Only ideas that aren't "dangerous precedents" are the duds.

IF you're planning to introduce a labor-saving method that will displace men, and you know there'll be a kickback, get it set to go anyway. Then wait for "evaporation" — normal quits and dismissals — to cut your working force to the newer, lower, level. There'll be no trouble—if your men trust you and the company.

Over 85% of the torque wrenches used in industry are

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Every manufacturer, design and production man should have this valuable data. Sent upon request.

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*after you've read this magazine*

. . . and clipped pertinent ideas, articles and advertisements for reference, *please do not burn or throw it away.*

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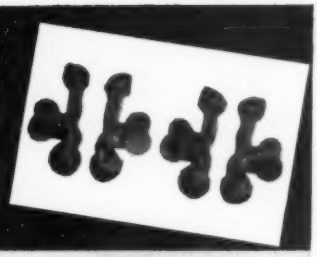
1) Wastepaper can help to swell the funds of your local Boy Scout Troop, your church or other community organization. It gets a good price these days.

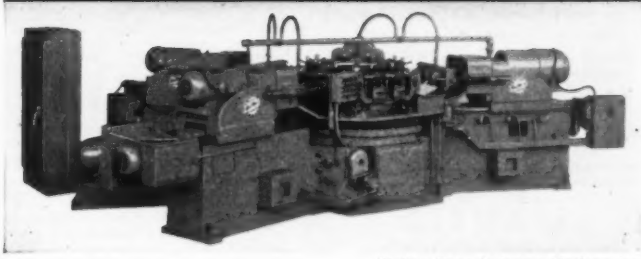
2) Whether in magazine form or not, wastepaper helps to fill the increasing need for paper pulp brought on by the mobilization effort.

**Collect it.** Give it to your favorite organization. Chances are they have scheduled pick-ups.

Drilling and Reaming

388 KING PIN HOLES PER HOUR





*Station Type Indexing Machine for drilling and reaming king pin holes.*

## On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
2. Drill .823" dia. — Balance of way through.
3. End Cut Ream .8547/.8550" — Full length of hole.
4. Finish Ream .8635/.8637"—Full length of hole.
5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

## 4 New Davis & Thompson Mechanical Power Heads

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REBUILT MACHINES

# Latest Types — Guaranteed Machine Tools 1941-1950 Models

### BORING MACHINES—PRECISION

BARNES: No. 412 Horizontal, 60" travel

### BROACHING MACHINES

CINCINNATI: 2-36 Vertical Broach

### CAM MILLERS & GRINDERS

SUNDSTRAND: #96 Double Head Miller for cylindrical cams
VAN NORMAN: Contour Miller 10CT
MOREY: 12M 2-Spindle Profiler, 12¾"x15" table
HEALD: 172 Sizematic Grinder for cylindrical cams

### DRILLING MACHINES

AVEY: No. 2 Deep Hole Drill, 16" stroke—hydraulic
LELAND-GIFFORD: No. 2LMS Deep Hole
BARNES: 201¼ 2-spindle on 3-spindle base
BAKER: 30HO 2-spindle inverted, hydraulic, deep hole
BAKER: 217 Upright Heavy Duty
FOSDICK: No. 4BM Upright, High Speed
PROVIDENCE ENG.: FV-6 Sensitive 6-Spindle, ⅜" capacity
PRATT & WHITNEY: ½E x 50 Deep Hole Reamer
ALLEN: #2 High Speed
ARCHDALE: Radial, all sizes (New)
WALKER-TURNER: D350, ½" capacity, bench type (new)

### ENGRAVING MACHINES

DECKEL type—3 dimensional, (New)
GORTON: 3U & 3Z, 2 dimensional
GORTON: 3B, 3 dimensional

### GEAR CUTTING MACHINES

BARBER-COLMAN: No. 3 Hobber
BROWN & SHARPE: No. 6 Gear Cutter 72" diameter, 1¾ D.P.
FELLOWS: 61A, 64A, 6Z2, 7 and 72 Shapers
FELLOWS: 61, 35" capacity
FELLOWS: Straight Line Generator
GLEASON: #12 Rough & Finish Generator
GLEASON: 3" Straight Bevel Gear
HAMILTON: No. 1 Hobber, 6" diameter
SYKES: Gear Shaper 14" external, 20" internal
SYKES: Rack Cutting Machine 24"

### GEAR FINISHERS & TESTERS

FELLOWS: 6LS1 and 13 LS1 Gear Lappers. External & Internal. Spur and Helical
FELLOWS: No. 12-C Spacing Tester
GLEASON: No. 13 Universal Tester
GLEASON: No. 4 and No. 8 Bevel Gear Testers, Hand and Power Operated
GLEASON: 3" Bevel Gear Tester
ILLINOIS: 514 Center distance & Concentricity Checker.
ILLINOIS: 604 Bevel Gear Hand Rolling Fixture.

### GEAR & SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel
GEAR GRIND MACH.: GG-18, 10"x24" Hydr. Spur Gears and Splines, also Internal
GLEASON: No. 17 Spiral, Zerol, and Hypoid, capacity 23½ P.D.

### GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10, capacity 6"x 18" Plain
BROWN & SHARPE: No. 23, capacity 10"x 48", Plain
CINCINNATI: 6"x18" Hydraulic
CINCINNATI: 10"x36" Hydraulic
LANDIS: 18"x18" "C" Plain Hydraulic
LANDIS: 18"x32" Type "D" Crankpin, Hydraulic
VAN NORMAN: #666 Crankshaft Regrinder
NORTON: 6"x18" & 10"x18"
NORTON: 10"x18" 45° angle wheel head

### GRINDERS—GEAR & SPLINE

PRATT & WHITNEY: 10" single and double wheel, hydraulic
GEAR GRIND MACH.: GG-18, 10"x24" Hydr. Spur Gears and Splines, also Internal
GLEASON: No. 17 Spiral, Zerol & Hypoid, capacity 23½ P.D.

### GRINDERS—INTERNAL

BRYANT: No. 5Y Internal
BRYANT: 112 Universal, Hydraulic
BRYANT: 16C16 Hole, Hydraulic
HEALD: 70A Plain
HEALD: 72A3, 72A5 Plain and Univ.
HEALD: 72A3 Sizematic Centerless
HEALD: 72A5 T-bed, Universal
HEALD: 172 Sizematic for cyl. cams
RIVETT: No. 104 Tool Room

### GRINDERS—RADIUS

VAN NORMAN: No. 73, 639, 649
VAN NORMAN: No. 3½ Universal

### GRINDERS—SURFACE

ARTER: A-1—8" Rotary
ARTER: A-3—12" Rotary
THOMPSON: 8"x12"x18" Type B
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck
GARDNER: 120A Opposed Head Disc, 20" dia. abrasive wheels and 34 "dia. rotary work carrier.

### GRINDERS—THREAD

EXCELLO: No. 31 external, dia. 5"x18" centers.
EXCELLO: No. 33 external, dia. 6"x18" centers.
JONES & LAMSON: TG-1245 External, 12"x 45"

### HONING MACHINES

BARNES: No. 306H Vertical, 25" stroke
MICROMATIC: H-510 Double End Horizontal
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia. capacity.

### LAPPING MACHINES

FELLOWS: 8LS1 and 13LS1 Gear Lappers
NORTON: No. 28 Hyprolaps
NORTON: No. 2F x 40" Diameter
SCHRAMEN: Model A External Cylindrical Lapper—6 heads.

### LATHES—PRODUCTION

LIPE-ROLLWAY: 15"x30" Carbomatic, Hydraulic
LODGE & SHIPLEY: No. 3A Duomatic
MICHIGAN: #1708 and 1712 Relieving
BLOUNT: HS Polishing, 12"x48"
WILLSON: 15"x48" Geared Head Motor Driven (New)

### LATHES—TURRET

BULLARD: 24", 36" Vertical
WEBSTER & BENNETT: Vertical Turret Lathes, 36" and 48" diameter (New)
GISHOLT: #2L Saddle Type, Extended bed, 24"
HERBERT: Turret Lathes, all sizes (New)

### MILLING MACHINES

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables
CINCINNATI: No. 2M Vertical, Rotary table with power feed, 20" diameter; 10½"x52" rectangular table
CINCINNATI: 0-8 Vertical
CINCINNATI: No. 4 Vertical
REED-PRENTICE: #5 Vertical 16"x60" table
SUNDSTRAND: 96 Rigidmil-Duplex (for milling cam tracks in propeller hubs or similar)
SUNDSTRAND: Nos. 0 and 00 Rigidmil
MOREY: 12M 2-spindle Profiler, 12¾"x15" table
TAYLOR-FENN: M-80 Duplex Spline
TAYLOR-FENN: Vertical 6"x21" table with power feed
RICE-BARTON: Duplex Spline
VAN NORMAN: Contour Miller 10CT

### SAWS & CUT-OFF MACHINES

MOTCH & MERRYWEATHER: No. 3 Circular Saw
TANNEWITZ: GH-36 Band Saw
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New)
CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
WILLIAMS: 10" Pipe & Tube Cut-Off

### THREAD MILLERS & TAPPERS

HALL PLANETARY: Model D Thread
LEES-BRADNER: LT 6"x36" Thread
LEES-BRADNER: 40A Thread Miller
MOREY: 12"x60" Thread Miller
MURCHEY: No. 22 Tapper, Horizontal, ½" to 2½" capacity
NATCO: Vert. Tapper 16 spindle
PRODUCTO: Hand Tapper

### TOOL SHARPENERS

OLIVER: 2A Face Mill Grinder
OLIVER: 510 Drill Sharpener
OLIVER: 10" Tool Bit-Template
FELLOWS: Flat Top Helical Gear Cutter
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), Automatic Indexing
WALKER-TURNER: Bench Grinder ½ HP

### MISCELLANEOUS

BAR POINTER & CHAMFER: Kent 3¼"
BAND SAW: Tannewitz, GH-36" Capacity
CUT-OFF: Campbell, Abrasive 425 Cutalator 4½" dia. capacity
CUT-OFF: Pipe & Tube, 10" Williams
DIE SINKER: Reed Prentice No. 5, 16"x60" Table
GRINDER: Walker Turner ½ HP Bench Type
LATHES: Blount Polishing 12"x48"
PRESS: Screw, Gen. Flex. 3 ton
RACK CUTTING MACHINE: Sykes 24"
RIVETER: Gen. Engr. 24" throat
TEST STAND: Denison 818-AM Hydraulic
SHAPER: 16/20" Edgwick (New)
PUNCH SHAPER: Sentinel Shrewsbury (New)

**TRIPLEX MACHINE TOOL CORP.**

*Machine Tool Engineers since 1919*

**75A WEST ST.** **Phone: HAnover 2-4520** ***Cable Address:*** **"TRIMACTOOL"** **NEW YORK 6, N. Y.**

## PRESSES

**300 ton Clearing Crankless, New 1942, 12" stroke, air cushion, Model F-1300-42, 36"x42" bed, air clutch.**

**180 ton Cleveland, New 1942, 18" stroke, Model #14-S, 28"x28" bed, air clutch.**

**Abrasive Cutoff, #213 Campbell, 7½ H.P., late.**
**Bending Roll, 8' x ½" Newbold, pinch, all steel, 1940.**
**Boring Mill, 72" Betts, vertical, 2 hds.**
**Boring Mill, 60 Gisholt, vertical, 2 hds.**
**Boring Mill, 44" Bullard Maxi-Mill, Vert. PRT, M.D.**
**Drill, 4 spindle, #2 KH Allen, ½" chucks, late.**
**Drill, 3 spindle, #2MS Leland Gifford, Mtr. Spdles.**
**Drill, Radial, 6' N-B-P "Rightline" M. on arm.**
**Drill, Radial, 6' Dreses, gear box, M.D.**
**Drill, Radial, 8' Western, gear box, M.D.**
**Gear Hobber, #36H Gould & Eberhardt univ.**
**Gear Lapper, Type 7LS Fellows, 1942.**
**Grinder, Surface, 6" x 18" Norton, hydraul., 1942**
**Grinder, Surface, 8" x 54" Thompson, M.D.**
**Grinder, Surface, #34 Abrasive Vert., '41.**
**Grinder, #5 Bryant, internal, late.**
**Lates, Duomatic, #3A Lodge & Shipley, 171" c.c., double carriage 1942.**
**Lathe, 68" x 24' Niles, grd. hd., M.D.**
**Lathe, 54" x 20' Johnson, taper, M.D.**
**Lathe, 36" x 30' Putnam, grd. hd., M.D.**
**Lathe, 24" x 10' American, taper, grd. hd.**

## For: Quality and Integrity!!

***Get the best!*** **Good machinery, properly reconditioned and fully guaranteed. Here are a few representative items from stock.**

**Lathe, 24" x 9' c.c. Reed-Prentice, grd. hd.**
**Lathe, 16" x 8' American, taper, M. in base.**
**Lathe, Automatic, 12" x 21" Fay, 1940.**
**Lathe, Automatic, 12" x 24" Lipe-Carbo.**
**Miller, Production, #1-12 Cincinnati, 1942**
**Miller, Universal, #4 Cincinnati, Hi-Power, M.D.**
**Miller, Plain, #1½ B Milwaukee, M.D.**
**Miller, Plain, #1B Milwaukee, M.D.**
**Miller, Production, #000 Brown & Sharpe**
**Miller, Vertical, #14 Cochrane Bly, slot. attach.**
**Planer, 36" x 36" x 12' Cincinnati, 2 hds., M.D.**
**Planer, 42" x 42" x 16' Gray, 3 hds., M.D.**
**Turret Lathe, #2G Morey, bar, collets, 1942.**
**Turret Lathe, #2 Bardon & Oliver, 1943.**
**Welder, 50 KVA Acme air-press, spot, timer, late.**

**WANTED** Yes, we want good machine tools in any quantity. Call or write us today.

T. M. REGISTERED U. S. PATENT OFFICE

CABLE OBRIEN PHILA.

## THE O'BRIEN MACHINERY CO.

PHILADELPHIA'S LARGEST MACHINERY DEALERS AND EXPORTERS

PHONE GArfield 6-1150

**1545 N. DELAWARE AVE., PHILA. 25, PA.**

## LATE MODEL MACHINE TOOLS . .

**AUTOMATICS**
1½" Four Spdl. Cone, 1940.
20"x25" Fay Automatic, 1942.
No. 3-B Ceco ⅞" Cap. 1942.

**DRILLS**
No. 4BM Fosdick, 1942.
No. 2 LMS Leland Gifford Hyd. 1942.

**GEAR EQUIPMENT**
No. 645A3 & 61A Fellows Gear Shaper, 1944.
No. 6 Gleason Revacycle, 1940.
No. 6 Gleason Gear Tester, 1942.
8" Red Ring Internal Shaver, 1942.
15" Red Ring Lapper, 1942.
Red Ring Universal Tester, 1942.

**GRINDERS, CYLINDRICAL**
14"x168" Norton Plain Type C, 1942.
14"x48" Norton Pl. Type C. Hyd. 1941.
14"x36" Landis Univ. Type C. Hyd. 1942.
12"x36" Norton Universal, 1941.
10"x18" Norton Type C Plain, 1942.

**GRINDERS—INTERNAL**
No. 24-36 Bryant, 1943.
No. 172 Heald Hyd. Gap, 1940.
No. 81 Heald Plain Hyd. 1940.
72A3 Heald Plain Hyd. 1942.
No. 50 Heald Hyd. 1943.
No. 5 Bryant, Late.

**GRINDERS—THREAD**
No. 35L Excello Precision, 1943.
No. TG-615 Jones & Lamson, 1942.

**GUN BARREL MACHINES**
No. 410 Barnes Deep Hole Drill, 1943.
No. ½Bx50 P & W Reamer, 1942.
No. ½Bx30 P & W Reamer, 1942.
No. ½Bx50 P & W Rifler, 1942.

**LATHES—ENGINE**
36"x396" American G.H.
20"x240" LeBlond, 1941.
20"x18" Reed-Prentice, 1942.

**LATHES—PRODUCTION**
No. 3A Lodge & Shipley Duomatic, 1941.
No. 3 FU Foster "Fastermatic", 1942.
14"x42" Monarch "Magnamatic", 1941.
Lipe Carbo-Matic, 1942.
LeBlond Multi-Cut, Late.
No. 4-14 Lo-Swing, 1941.

**LATHES, TURRET**
No. 4A Warner & Swasey, 1942.
No. 1A Warner & Swasey, 1938.
No. 1H-6 Libby Universal, 1942.

**MILLS, PRODUCTION**
No. 4-36 Cincinnati Hydro, 1942.
No. 5-48 Cincinnati Hydromatic, 1942.
No. 2-20 Kent Owens, 1942.
No. 1-14 Kent Owens Hyd. 1942.

**MILLS, THREAD**
6"x6" LT Lees Bradner, 1942.

**MISCELLANEOUS**
48"x1½" Niles Plate Straightener.
No. 616 Cleveland Rigidturner, 1942.

**SHAPERS**
20" Cincinnati Plain, Late.
6" Pratt & Whitney Vertical, 1942.

**WELDERS**
100 KVA Taylor-Winfield Seam, 1943.

*Write for latest stock list*

## INDIANAPOLIS Machinery & Supply Co.

1961 S. Meridian St. • • Indianapolis, Indiana

## MUST MOVE PROMPTLY FROM LOCAL CUSTOMER'S PLANT

BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

GOULD & EBERHARD 40" Gear Cutter, M.D.

BROWN & SHARPE #5—48" Gear Cutter, M.D.

KEMPSMITH #4 Maxi-Miller, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 30"x64". Quantity of boring bars.

LODGE & SHIPLEY 30"x72" c to c Geared Head, Quick Change Lathe, M.D.

CINCINNATI 60"x60"x14' Planer. 4 heads. 1 extra side head on massive floor stand for open side work. M.D.

LEBLOND 28"x14' QUICK CHANGE LATHE. Cone or M.D.

AMERICAN 20"x16' QUICK CHANGE GEAR LATHE. M.D. Old, but good.

BARNES HEAVY DUTY 26", 4-SPINDLE DRILL. 1 spindle for tapping. M. D. #4 M.T.

GRINDERS—CYLINDRICAL. B & S #11. 12"x 32". Plain Grinder. Table swivels. Motorized.

LANDIS 10"x36" Plain, M.D. Also Planer type Grinder 16"x36".

GRAY 32"x32"x10' PLANER. 2 swivelling heads. M.D.

"BEMENT" 26" STROKE TRAVERSING HEAD SHAPER. 48" travel to ram. 2 tables.

(PLANER SHAPER)

**THE OSBORNE & SEXTON MACHINERY CO.**

**P. O. Box 88 Columbus 16, Ohio**

# SOME LATE MACHINES STILL AVAILABLE

## BORING MILLS

Bullard 24", VTL New Era
Cleveland 2½" Bar Cap.
Giddings & Lewis No. 0, 3" cap.
Giddings & Lewis No. 32, 3⅜" cap.
King 42" & 72" Vert. 2 rail heads
Niles-Bement-Pond 4" Bar
Niles-Bement-Pond 4½" Bar
Niles-Bement-Pond 60" Vert.

## DRILLS AND RADIALS

American 4'x11" col, 6'x15" Univ.
Buffalo #2 Motor Spindle
Cincinnati Bickford 6'x13" col.
Cincinnati Bickford 4'x9" col, late
Walker-Turner Radial.

## ENGRAVERS

Auto Engravers Bench Type
Deckel GK2 Type 3 Dimensional, New
Gorton #1A 2 Dimensional
Gorton #3B 3 Dimensional
Gorton 3L 3 Dimensional

## GEAR EQUIPMENT

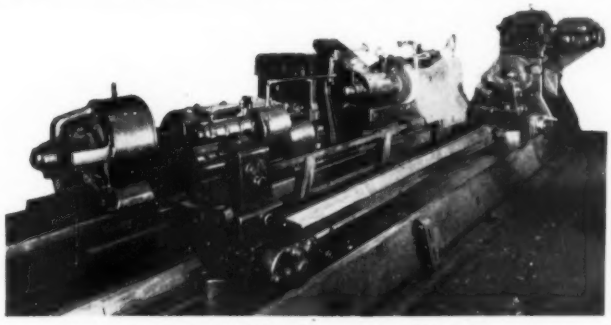
Barber-Colman #12 Hobber (2)
Brown & Sharpe #13 Cutter
Fellows High Speed Shapers 712, 72, 725
Flather 72" Cutter
Gleason 3" Straight Bevel Generator
Gleason #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
National Broach Red Ring Lapper, Shaver
Schuchardt & Schutte #1 Hobber

## GRINDERS, MISCELLANEOUS

Cinn. #2 centerless
Cinn. 12x48" Univ. Filmatic
Covel #91A Univ. Tool & Cutter, Hammond #4
Grenby Int. 1G-12, G2
Heald #73 Internal centerless
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic, #1 Tool
Landis 12"x36" Univ., Latest
Landis 6"x30" Type C Cyl.
Majestic Internal
Norton 6"x18", 6"x30" Type C cyl., 10x18"
Norton 14"x48" Type C Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer, Sellers 4G, 6G, Black Diamond
Port Cable Belt WGB, G8 Grenby Int.
Pratt & Whitney Radius #R6, K.O. Lee Tool

## GRINDERS, SURFACE

Abrasive 3B 8x24", #33, #34 Vert.
Blanchard #16, 30" Mag. Chuck
G & L #45 12"x24" Hyd. Feed, #5, 10"x36"
Heald 22—12" chuck, Arter 12"
Norton 10"x36" Hyd.
Pratt & Whitney 12x36" Vert.
Reid 11x36 Motor in Base
Thompson Hyd. 6x10x18", 6x12x18"



Norton Roll Grinder 50" x 28' (actual photo)

## LATHES

American 20"x8' Bed G.H. Lathe
L & S #2A Duomatic, Like New, #3 Duomatics
Hardinge Precision 9", 1" Collet Cap., Rivett
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed
Monarch 10"x20" EE Latest (5)
Monarch 12"x30" CKK Late (3)
Putnam 36"x22'
Putnam 42"x17'
Sebastian 12"x4' G.H.
Wickes 32"x35' Geared Head

## MILLS, PLAIN, UNIVERSAL & PROD.

Archdale Plain
Brown & Sharpe #000, 21
Burke #4 Plain & Univ. Vert. Hd.
Cinn. 2MH Univ. Vert. Attach
Cinn. 08 PL—Rise & Fall
Cincinnati, 1M Univ.
K. & T. 2HL Plain
Kent Owens 1V, 1M
Sundstrand 00, 0 Rigidmil
118 Van Norman, Prod.

## MILLS, VERTICAL

Archdale Vert. 15" Rot. cable
Brown & Sharpe #3 single pulley drive
Cincinnati #4, 08 Vert. #2, 3, SPD
Morey #12M Profiler, 2 sp.
Pratt & Whitey #12B Profiler 2 Sp., 1 Sp.

## PRESSES

Bliss 645, 650 Hi-Production Presses
Bliss 18, OBI, 58, 62, 162 OB.
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 SS
Bliss 31½A Double Action Toggle
Ferracute EG54, 400 Ton Knuckle
Niagara Horning, 15 Ton
Niagara A1¾, O.B.I.
Toledo 400 Ton Knuckle Joint #663
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing

## TURRET LATHES

Acme 6W Fox
Brown & Sharpe, #1, 2 Hand, #10, 11
Denver, 6, 2" Shell Turret (3)
Gisholt 5, 2L, Late, Foster #3B
Jones & Lamson 2½" Saddle Univ. Late
Libby #4R 2" Cap. Univ. Late
Morey #4 Univ. 2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, 2A
Warner & Swasey #2 G.H. Late

## HYDRAULIC EQUIPMENT

### SELF CONTAINED PRESSES

500 ton Shaft Straightener 24' Long Bed. Watson Stillman
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
80 Ton Wilson Press, 51"x24" Platen, 11½" St. 13" opening
50 Ton William & White, 20" St. 54"x 20" Bed—24" opening
35 Ton Oil Gear Straightener
50 Ton Stokes Molding Press

### MISCELLANEOUS PRESSES

550 Ton Southwark, 42"x32" Platen 28" St. 48" opening
300 Ton Watson Stillman 24x20" Platen 11" St. 21" opening

*All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.*

## NEW IN STOCK

Air Hydraulic Presses—Arbor Presses #6C Famco — Band Saws Kalamazoo — Drill Presses all sizes—Hydraulic Press Northern 20 Ton—Injection Molders, 1 ounce—Power Presses, OBI, 1, 4½, 5, 7½, 10, 15, 20, 30 ton—Shaper, 7" Amco, 8" Shaperite—Shaper, Sheldon 12"—Shears, Foot 22" to 8', 16 & 18 ga.—Shears, Power, 3'x18 gauge to 10'x 10 ga.—Welders, Arc, Seam, Spot all sizes—Vert. Milling Attach. Halco H.S. Motors, Grinders, Buffers, all sizes.

## MISCELLANEOUS

Automatic B & S #00G
Automatic 4 Sp. 1½" Conomatic
Band Saw: DoAll Zephyr 36"
Band Saw: #8 Marvel
Filers—DoAll Band Filer
Filers—Grob Band Filer
Hacksaw: Marvel #6, #9; Peerless 6"x6"
Honer: Micromatic #H-1
Keyseater: Davis, Baker, M & M
Welder: 50 K/A Eisler Air Operated
Welder: Taylor-Winfield 50 KVA H1-Wave

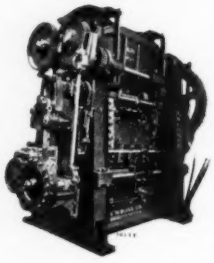
***This is but a partial listing. Write for free Catalog. Inquiries invited. HUNDREDS OF OTHERS***

**AARON MACHINERY CO., Inc., 45 Crosby Street, New York 12, N. Y.**
**"CABLE—AARMACH N. Y."** **Telephone WOrth 4-8233**

# ENGINEERED REBUILT MACHINE TOOLS

BUILT MACHINE TOOLS

ENGINEERED REBUILT



**No. 011 Bliss Perforating Press**

(Multiple Punch) with double roll feed and lateral action to feed rolls. Device for variable feed and cam actuated stripper. Width between housings 72". Capacity for 60" width sheet using lateral feed. Punching capacity 190—1⅛" holes. Approx. weight 48,000 lbs. Inspect at Albany.

**HORIZONTAL BORING MILLS**

5" Bar No. 45 Giddings & Lewis
5½" Bar N-B-P Floor Type
8" Bar N-B-P Floor Type
10" Bar Sellers, Floor Type

**PRODUCTION DRILLING MACHINES**

No. 420 Barnes, Deep Hole, capacity 3"x12' through solid steel
BAUSH Extra Heavy 2-Way, 32" dia. heads, 6' to 14' between drills

**LATHES**

32"x12' cc Niles, Forge, 2-carriages
36"x30' cc American "High Duty"
42"x18' cc Putnam 18-speed geared head
42"x32' cc Niles Engine, 2-carriages
50"x39' cc Pittsburgh, 2-carriages
54"x20' cc N-B-P, Triple Geared
60"x10' cc Niles, 24-speed geared head
84"x66' cc N-B-P, 2-carriages
120"x35' cc Bement, 3-carriages
14'x34' cc N-B-P, G.H. Engine
60" John Bertram Car Wheel

**GRINDERS**

No. 5-T Sellers, Tool
30"x168" Landis, Roll
13"x13"x36" Hanchett, Series 300
No. 16, 26" Blanchard

**PLANER MILLERS**

30"x24"x12' Horizontal Arbor
48"x56"x18' One Rail, 2-side
72"x60"x20' 2-rail, 2-side

**PLANERS**

36"x36"x10' Cincinnati, 2-rail
48"x48"x18' D & H, 2-rail, one side
72"x72"x18' N-B-P, 2-rail, 2-side
84"x75"x20' D & H, 2-rail, one side
60"x60"x18' D & H Openside
72"x72"x24' D & H Openside
9'x9'x35' D & H Convertible
No. 3 Niles, 23' Plate

**SIMMONS MACHINE TOOL CORPORATION**

MAIN OFFICE AND PLANT: 1759 N. BROADWAY, ALBANY 1, N. Y. NEW YORK OFFICE: 50 EAST 42ND STREET

ENGINEERED Machine Tool REBUILDING



# GUARANTEED MACHINE TOOLS

**PLANERS**

30"x30"x8' Gray, s/c speed-variator MD
30"x30"x18' Whitcomb, 2 heads MD
36"x36"x18' Gray Extra Hvy Duty, 2 heads, BD
42"x42"x10' Niles-Bement-Pond, 3 heads, BD
42"x42"x14' Niles-Bement-Pond, 4 heads, MD

**SHAPERS**

16" Niles B.G., cone
20" Gould & Eberhardt H.D. B.G., cone
21" Smith & Mills B.G., cone
24" Gould & Eberhardt H.D., MD
28" Gould & Eberhardt Invincible B.G., MD

**LATHES**

16"x30" centers Sidney Tritrol 16-speed Grd. Hd., MIL, new 1940
18"x46" centers American 12-speed Grd. Hd., MIL
19"x74" centers LeBlond 12-speed Grd. Hd., MIL, taper
20"x25" Fay Automatic, new 1943
20"x94" centers American Grd. Hd., MD
21"x136" centers LeBlond Hvy Duty, Turner drive, taper
24"x72" centers Bridgeford, Cullman drive
30"x127" centers Lodge & Shipley, cone

**MILLING MACHINES**

No. 00 Sundstrand Rigidmil, MD, late type
No. 2-24 Cincinnati Plain Automatic, MD, new 1943
No. 1-B Milwaukee DOA Plain, MD
No. 2 Cincinnati H.P. Plain, MD
No. 2-B Brown & Sharpe Heavy Plain
No. 2-M Cincinnati Univ., MD
No. 2-24 Cincinnati Plain Automatic, MD, new 1943
No. 3-B Milwaukee Univ., SPD
No. 4 Cincinnati H.P. Univ., Lima Drive
No. 4-B Brown & Sharpe Heavy Plain, MD
No. 2 Knight Vert. Miller & Driller, MD
No. 4 Cincinnati Vertical, SPD

**GRINDERS**

No. 11 Brown & Sharpe Plain Cylindrical, BD
No. 3 Abrasive 8"x22" Surface, BD
18"x72" Norton Plain Cylindrical, MD
20"x144" Landis Plain Cylindrical

***Many other machines in stock. Send us your inquiries.***

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*Three minutes from the Cincinnati hotel district.*



ANGLE ROLLS, 2"x2"x¼" H. & W., '42
BOLT THREADER, 1½" Williams Reliance
BORING MILLS, 100" & 60" Cincl., 2 Hds., P.R.T.
BORING MILLS, 3½" & 4" bar Landis Floor (3)
4½" bar Niles table, Dual Control
BORE-HONE, Barnes, 10 stroke, 6" bore, '42
BRASS LATHE, 21" Acme, Late, Hardened Ways
RADIAL, 5'12" col. Amer. Trip. Purp., M-on-arm
DRILL, 28" Colburn No. 6, 3" capty. 15 H.P., AC
DRILL, 25" Weigel, Tapping, M.D.
DRILL, 24" Colburn #14, Comp. Tble. 2" capty.
GEAR GENERATOR, 3" Gleason, Late
GEAR HOBBER, 36H Gould & Eberhardt
GEAR HOBBER, #12 Barber Coleman
GEAR PLANER, "11" Rienecker, Bevel
GEAR SHAPER, No. 75 Fellows High Speed
6IA, 64 & 64A, 6 Fellows
GRINDERS, 20"x120" Landis, Cyl., Hyd., AC
GRINDER, 16"x48" Cinc. Cyl., M.D.
GRINDER, No. 6-T Sellers, Tool, '42
GRINDER, No. 16Y2B Bryant, Int., 1943
GRINDER, No. 174 Heald Gap, Int. 54" sw., '42
GRINDER, No. 72A5 Heald Internal, 1943
GRINDER, No. 75A Heald, Int. Hand Feed
GRINDER, Micro-Internal, Large
GRINDER, SURFACE, 13"x48" Hanchett Vert. Spin; No. 16 Blanchard, 26" Chuck
GRINDER, UNIV. 12"x36" Thompson M.D.
LATHES, 30"x15' Con. Niles, blocks to 68", M.D.
48"x20'6" cen. Simmons, like new, '42
LATHE, 42"x31' cen. Putnam Grd. Hd.
32"x25' cen. Sommerfeld, 2 T.A., 2 carr., '42
22"x24¾"x48" cen. Skoda, New
20"x48" cen. American, T.A., (2)
No. 16 LeBlond Pro. 20" sw. x 36" cen.
TAPPERS, Nos. 1 & 2 Bakewell (4)
TURRET LA., 28" Libby "C" 4½" capty.
No. 1B Foster Univ., 2" capty. (2)
No. 2B Foster Univ. 3½" capty. Bar.
RIGID-MIL, 90" Sundstrand, Tble. 30"x120"
THREAD MILLER, 12"x60" Morey Shields, '42
MILLER, UNIV., No. 2A B. & S., M. In base, Timken Nos. 2 & 3 Cincl. Pl. Cone Motorized
MILLER, VERT., No. 4 Cincl. Hi Power, M.D.
MILLER, HORIZ., No. 2 Stand. K.&T., M-in-base
NIBBLER, 30" Gray-Savage #236
PIPE THREADER, 2" Landis, AC, M.D.
PLANER, 48"x36"x8' Cincl. 4 Hd., Box, PRT. Force Feed
SHAPERS, 24", 20" & 16" G. & E., AC, M.D.
22" & 16" Hercules, Univ., New
36" Morton, Draw-Cut M.D.
SLOTTER, 20"—24" Dill, M.D.

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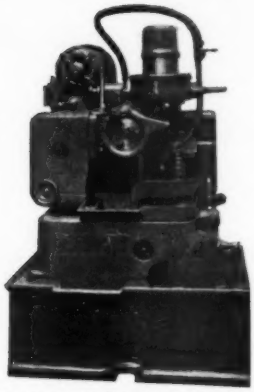

FELLOWS No. 75 High Speed Gear Shaper.

### BORING MILLS—HORIZONTAL

FRANKLIN 4½" Bar Table M.D.
NILES 8" bar, floor type, Motor Drive

### BORING MILLS—VERTICAL

NILES 100"; 2 swivel heads, PRT, DC, M.D.
NILES-BEMENT-POND 144" heavy duty M.D.

### BROACHES

CINCINNATI 1-30 Duplex Vert. Hydro. Late
AMERICAN Model 6-G Hyd. Rifle Broach, Late Type

### DRILLS—MISCELLANEOUS

BARNES No. 420 Deep Hole, Latest Type
BARNES H-3, Hydram, Hyd., Inverted
BARNES H-2, Hydram; Hydraulic; MD
BARNES 20" 4 spindle, Late Type
Barnes 24" all geared Camel Back; M.D.
BAUSH 1½"x30" Deep Hole, Late Type
LeBLOND No. 2 Deep Hole, Late Type
FOOTE-BURT 20 Spindle, Multiple Spindle
NATCO 2BL Multiple; Holesteel; PRT; MD
NATCO No. 14 Multiple Rect. Hd. PRT; M.D.
NATCO D-5 Adjustable, Multiple, Late Type

### GEAR CUTTING EQUIPMENT

BARBER COLMAN No. 12 Hobber, M.D.
BILGRAM 6" & 16" cap. Bevel Gear Gen., M.D.
BROWN & SHARPE No. 13 Spur, Bevel
CROSS No. 1 Tooth Rounder, Motor Drive
FELLOWS Nos. 61A, 6Z2, 72, 715, 712, 725, 7, 77 High Speed Gear Shapers, Late Type
FELLOWS No. 12M Involute Measuring Inst.
FELLOWS No. 13LS Lapper, Late Type
GLEASON 3", 12" straight bevel gen., Late
GLEASON 24", 37", 77", 96" Bevel Gear Planer, M.D.
GLEASON 4, 6, 18 Bevel and Hypoid Tester
GLEASON No. 14 Hypoid Grinder, Late
GOULD & EBERHARDT 96H Hobber M.D.
GOULD & EBERHARDT 18 H Hobber, M.D.
NEWARK No. 5 Gear Hobber, 72" cap., P.R.T., DIFFERENTIAL INFEED, M.D.
PRATT & WHITNEY 10" Gear Grinder; hydr., Late Type

### GRINDERS—CYL., PLAIN & UNIV.

BROWN & SHARPE No. 1, Univ., Late Type
BROWN & SHARPE No. 5 Plain; cap. 3x18"; Late Type
CINCINNATI 16"x36" Univ. Model ER
LANDIS 6"x18", Type C, Pl. Hyd., Late Type
LANDIS 18"x72" Type C Plain; M.D.
LANDIS 29"x130" Centers, plain, M.D.
NORTON 10"x72" Type C, plain, Late Type
NORTON Model D-86 17"x42" centers crankpin, hydraulic, Late Type
NORTON 10x36" type C Plain Hydr.; MD; Late Type
VAN NORMAN No. 666 Crankshaft, regrind; Late Type

### GRINDERS—MISCELLANEOUS

BRYANT No. 3, 6, 16-C-16, 16-CF-16, 24-36" Internal Hydraulic, Late Type
GLEASON No. 12 Tool Sharpener, Late Type
HEALD 72A5 "Gagematic" Internal, Late
HEALD No. 72A3 "Gagematic", Motor Drive
SHEFFIELD Micro-Form Grinder, Late Type
THOMPSON 6"x48" Auto., broach M.D.
VAN NORMAN 639, Osc. Radius, Late Type

### GRINDERS—SURFACE

ABRASIVE No. 34, 8"x24" Hyd. vert. M.D.
PRATT & WHITNEY 14"x36" type "B"

### LATHES—ENGINE & MFG.

AMERICAN 24"x216" centers; geared; Timken; Late Type
AMERICAN 36"x33' centers geared; M.D.
AMERICAN 36"x360" centers, 2 carriages
JONES & LAMSON "Fay" 24"x24", 20"x25" Automatic, Late Type
LeBLOND 20"x48" centers; geared; Timken Late Type
LeBLOND 22"x48" centers; Late Type
LeBLOND 16"x36" Centers, Auto. Timken
LODGE & SHIPLEY 24"x120" centers; grd.
LODGE & SHIPLEY No. 5x24" and 96" Centers, "Duomatic", Timken, Late Type
LE BLOND Model 7ACL Crankshaft; M.D.
LoSWING 4x60, 4x84, 8x60, 8x108, 5x34, Late Type
MONARCH 14"x42" centers; Mod. "Z" Magnamatic Automatic; Timken; M.D. Late
MONARCH 16"x28" centers, geared M.D.
MONARCH 22"x456", 3 carr. Tim. CM, M.D.
NILES 30"x11' centers "Time-Saver"; M.D.; Late Type
NILES "Time-saver" 30"x50' Boring, Timken
NILES 48"x32' Centers engine; geared; M.D.
SPRINGFIELD 14"x43",16"x24", Geared M.D.

### LATHES—RELIEVING

CLEVELAND 12"x16" Centers, Cutter Reliver, M.D.
U.S. TOOL 810-B Cutter Reliver, Late Type

### LATHES—TURRET

MOREY No. 2, 1" capacity; Late Type

### MILLING MACHINES—PLAIN

CINCINNATI 4-48 4-spindle, Tracer, Late
CINCINNATI 6-8, 3-24 Simplex; Late Type
SUNDSTRAND No. 3, Rigidmil, Timken, M.D.
U.S. Model MM-1-6 Automatic, Late Type

### MILLING MACHINES—MFG.

HALL Style D. Planetary, Late Type
INGERSOLL 32x24x16' Planer Type, 2 hds., M.D.
INGERSOLL 36"x42"x12' Adj. Rail Slab, M.D.
SUNDSTRAND Model 3A Duplex 42" Feed, Late Type
TAYLOR & FENN M80 Duplex Spline, Late

### MILING MACHINES—THREAD

MOREY 12x30", 60", 120", 198" centers, Late
PRATT & WHITNEY 4½"x12" Model C, late type

### SAWS

ESPEN LUCAS No. 670—20" cap. Hydr. Late
HELLER Model SS-L, 6¾" capacity Cold Saw, M.D.
PEERLESS 14"x14" Hydraulic, Late Type

### PLANERS

CLEVELAND 48"x48"x12' Openside, M.D.
BETTS (CONSOLIDATED) 108"x84"x50', 4 hds., P.R.T., Box Table, DC Reversing, M.D.
BETTS (CONSOLIDATED) 84"x92"x16', 4 hds. P.R.T., Box Table. DC Reversing M.D.
LIBERTY 48"x48"x16' 4 hds. vari-voltage drive — Late Type
LIBERTY 72"x48"x20' 4 hds. Convertible, openside vari-voltage drive—Late Type
NILES 108"x84"x42', 4 hds., Rapid Traverse, Box Table, D.C. Motor Drive
NILES 30"x30"x10'; 2 Heads, Box Table, Hyd., M.D.
SELLERS 60"x60"x12' 4 hds. vari-voltage drive P.R.T., Late Type
WOODWARD & POWELL 54"x54"x20', 4 hds., M.D.

### PRESSES

BESCO Mod. 21 Incl. 40 ton; 3" stroke; NEW
BIRDSBORO 325 ton, vert. hyd., Late Type
BLISS No. 410A toggle drawing; tie rod steel gearing
BLISS No. 3½A geared toggle, dble. acting
CLEARING K-1200-30, 200 ton Knuckle Joint Press
GLEASON 15", 25", Quenching Hyd., M.D.
LAKE ERIE 500 ton Vert., Hyd., Late Type
NIAGARA No. 512 DG tie Rod; approx. 282 tons; M.D.

### SHAPERS

CINCINNATI 16", 20" Univ. Heavy, P.R.T.
LAMAIRE 18" Vertical Hydraulic, Late Type
PRATT & WHITNEY 6" Vertical, M.D.

### SHEARS

BESCO Power Squaring; 36", 20 ga. NEW
BESCO Power Squaring; 36", 14 ga. NEW
BESCO Power Squaring; 96", 10 ga. NEW
BESCO Foot Shear; 48", 16 ga. NEW

### MISCELLANEOUS

ACME 2" forging, upsetting; latest type
BAKER No. 5 Keyseater, Motor Drive

**WATCH THIS PAGE**

For MODERN high quality machine tools nearly all built new since 1941. These tools are priced well within your equipment budget. *Wire, write or phone for pictures, details and prices, today.*

BAKEWELL No. 1 No. 1R Precision Tapper
BARNES No. 172. 306H, Vertical Hone, Hyd.
BROWN & SHARPE No. 0G; No. 00G Auto.
DeLAVAL No. 194 Coolant Clarifier, late
FISCHER No. 1, No. 2 Oil Groover; M.D.; Late type
FOSTER 4"x36" Centers, Superfinisher, late
LANDIS 2" Single and Double spindle Threader, M.D.
MANVILLE No. 2 Slotters; Late
MANVILLE No. 3 Trimmers; Late
MANVILLE No. 3 Reheaders; Late
MILWAUKEE 5 ton, 10 ton and 25 ton Overhead Traveling Cranes, 230 volt, D.C.
NAZEL 4B Pneumatic Hammer, Motor Drive
P & W (KELLER) Type BL2416 Type G Copying Machine, late
QUICKWORK ¾" Rotary Shears; Cap. 1", M.D.
WATERBURRY FARREL ½" cap. nut trapper, late

DETRICK & HARVEY 48"x48"x16' planer

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## SCARCE MACHINE TOOLS

No. 0 Vernon Plain Horizontal Mill (late)
No. 1-12 Cincinnati Plain Automatic Mill, late
No. 10 Brown & Sharpe Automatic Mill, late
No. TG-615 Jones & Lamson Hy. Thread Grinder (1942)
No. 72A5 Heald Plain Cylindrical Grinder, late
No. 2 Cincinnati Centerless Grinder, serial H20230
10"x18" Landis Hy. Plain Grinder, late
No. 2 Brown & Sharpe Universal Grinders, late
No. 4A Warner & Swasey G.H. Turret Lathe, ser. 292,000
No. 5 Bardons & Oliver Turret Lathe, serial 14063
12"x63" Fay Automatic Lathe, 1940
R-14 Seneca Falls Lo-Swing Aut. Production Lathe, 1940
8½"x8" Goss & deLeeuw Chucker
16"-17½"x84" Porter McLeod Engine aLthes, late (2)
No. 16A Gorton Swiss Type Automatic, late
4½" Model A Cleveland Automatic
9/16" Model DA2 Davenport Automatic
No. 00, No. 0, No. 2 Brown & Sharpe H.S. Automatics
No. 2, No. 3, No. 4, No. 4½ O.B.I. Punch Presses
No. 8 Marvel 18"x18" Metal Band Saw, late

MACHINE TOOLS

TELEPHONE TAylor 9-8200
LAKE MACHINERY COMPANY
942 WEST LAKE STREET • CHICAGO 7, ILLINOIS

## FINE LATE TYPE GUARANTEED TOOLS

No. 3A WARNER & SWASEY Saddle Type Turret Lathe, serial 571000, new 1941

No. 4 GISHOLT Ram Type Universal Turret Lathe, bar feed, chuck and tooling, new 1942

No. 5 GISHOLT Ram Type Universal Turret Lathe, preselector head, bar feed, chuck & tooling, new 1942

No. 2L GISHOLT Universal Saddle Type Turret Lathe, preselector head, bar feed, chuck & tooling, new 1942

No. 3 WARNER & SWASEY Ram Type Universal Turret Lathe, serial 529000, new 1940, bar feed & tooling

24"x21' bed LODGE & SHIPLEY Selective Geared Head Lathe, 2 carriages, 25 HP motor, new 1941

4" bar LUCAS Table Type Horizontal Boring Mill, new 1941

100" BERTRAM (Niles Patterns) Vertical Boring Mill, 2 heads on rail, rapid

Model 130 CLEVELAND Rigidhobber, new 1942, practically new condition

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1825 NIAGARA ST BUFFALO 7, N.Y.

## GEAR AND SPLINE GRINDER

Type GG-35 GEARGRIND—18" External, Hyd. Table Stroke 27" New 1942—220/440/3/60 Elec.

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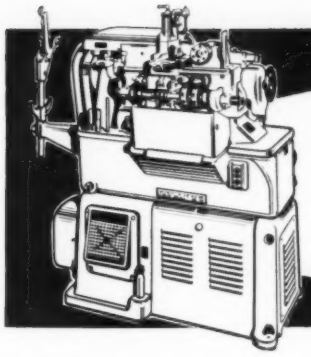

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## BROWN & SHARPE AUTOMATIC SCREW MACHINES

***Not Just Rebuilt . . . . But Beaver-Bilt***

**Beaver-Bilt Brown & Sharpe machines are *unconditionally guaranteed* to produce work to the same tolerances as new machines. Only genuine B & S replacement parts are used and no change is made from standard.**

***The following late type, high speed Brown & Sharpe automatic screw machines are now in stock for immediate delivery. . . .***

2—No. 00G H.S. Serial Nos. 13217 and 13218 (1938); Swing Stop, Vertical Cutoff Slide, ½" Spindle Cap., 6000 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.

1—No. 00G H.S. Serial No. 18847 (1945); Swing Stop, ½" Spindle Cap., 6000 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.

1—No. 0G H.S. Serial No. 10860 (1943); Swing Stop, ¾" Spindle Cap., 4150 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.

8—No. 0G H.S. Serial Nos. 10858, 10859, 10861 (1943); 13445, 13453, 13454, 13466, 13473 (1946); Swing Stop, Vertical Cutoff Slide, ¾" Spindle Cap., 4150 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.

7—No. 2G H.S. Serial Nos. 9165, 9279, 9281 (1942); 10898, 10960, 10987, 11129 (1944); Swing Stop, Vertical Cutoff Slide, 1¼" Spindle Cap., 3000 R.P.M. Spindle Speed. Motor in base. Beaver-Bilt.

1—No. 2G H.S. Serial No. 12284 (1946); Swing Stop, Vertical Cutoff Slide, 1½" Spindle Cap., 2150 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.

### TRADE-IN SPECIALS IN GOOD OPERATING CONDITION AT A FRACTION OF ORIGINAL COST

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| 2—No. 00 | Standard B. & S. Automatic Screw Machines Serial Nos. 3830 and 2150 less countershafts. |
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| 6—No. 0 | Standard B. & S. Automatic Screw Machines Serial Nos. 3181, 3344, 2503, 3574, 3123, 3184 less countershafts. |
| 1—No. 0 | High Speed B. & S. Automatic Screw Machine Serial No. 8412 with New Drive-All Motor Drive. |
| 3—No. 2 | Standard B. & S. Automatic Screw Machines Serial Nos. 587, 1324, 1325 less countershafts. |
| 1—No. 2G | Standard B. & S. Automatic Screw Machine Serial No. 3883 with Geared Head Single Pulley Drive with motor and all standard equipment. |

### OTHER FINE MACHINE TOOLS

6— Hardinge Second Operation Machines, Bench Type (less bench) with Hand Lever Opening and Closing Collet Type Bronze Bearing Headstock (less collets) Serial No. 1755, 9/16" Collet Cap. mounted on a 30" length Bed. There are not any cross slides or turret slides with these machines. Also, less any motor drive. Price each.....$125.00

1— Hardinge Second Operation Machine. Bench Type (less bench) with Hand Lever Opening and Closing Collet Type Ball Bearing Spindle Headstock (less collets) Model No. 47-14372, 9/16" Collet Capacity Mounted on a 30" length Bed. Complete with Cross Slide and Model B Six Hole Index Turret Slide. Less any motor drive. This machine was new in 1945 and is like new guaranteed condition. Price ..... $850.00

1— De Laval 2 Bushel Oil Separator Serial No. 8912 complete with motor drive. Price .....$850.00

1— No. 1C Haskins High Speed Production Tapping Machine. New 1944 and in excellent condition.

1—000 Brown & Sharpe Production Milling Machine Serial No. 1616 with electric pushbutton controls. New 1944 and in excellent condition.

1—No. 1 UDA Snow High Speed Universal Air Controlled Drilling Machine. New in 1948 and in excellent condition.

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**Any Beaver-Bilt or "as is" machine sold by us can be operated in your own shop for a period of 30 days and, if found unsatisfactory for any reason whatsoever, may be returned freight prepaid for a full refund of the purchase price.**

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**NEARLY $1,000,000.00 WORTH OF EQUIPMENT MUST BE SACRIFICED. NO REASONABLE OFFER REFUSED.**

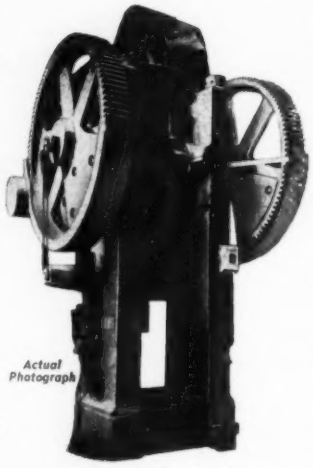
### SHEARS
CLEVELAND type 443 Vert. Trimming; 1½" stroke
GARRISON 132" Gate; cap. 1"
LEWIS #5½ Alligator; 5¼" stroke
LONG & ALLSTATTER Type A dble. geared Gate
LONG & ALLSTATTER Type B double head copying
MACKINTOSH HEMPHILL Bar; stroke 3½"

### PRESSES—Hydraulic
BEMENT MILES (upward) 36" stroke
BETHLEHEM (downward) 16" stroke
BETHELHEM (Downward) Flanging, 66" stroke
MACKINTOSH-HEMPHILL (upward) 30", 36", 60" strokes

### PRESSES—Power
BLISS No. 10A, 450 tons, 12" stroke
BLISS No. 15, 1200 tons, 20" stroke
FERRACUTE 100 ton cap., 2" stroke
TOLEDO No. 88 single crank, 16" stroke

### PUNCHES—Vertical, Open Gap
CLEVELAND type EF, 1½" stroke
CLEVELAND Type C, ½" stroke
CLEVELAND type C, 1⅜" stroke
HILLES & JONES No. 2, 1½" & 1⅝" strokes
HILLES & JONES No. 3, 2½" stroke
LONG & ALLSTATTER No. 2, 1¾" stroke
LONG & ALLSTATTER No. 3, 1½, 1⅜" stroke
MACKINTOSH-HEMPHILL No. 3, stroke 2½"
MASSILLON No. 5, 1¾", 2" strokes
WILLIAMS & WHITE No. 17, cap. 1" x ⅝"

### PUNCHES—Multiple, Open Gap
CLEVELAND 500 ton Vert. 30" IX; 6" stroke
CLEVELAND 500 ton Vert. 30" IX, 3" stroke
CLEVELAND 24" Angle, 2½" stroke



*Actual Photograph*

TOLEDO No. 88 single crank Press

### PUNCHES—Multiple
CLEVELAND No. 1, ⅜" cap. 6" stroke
CLEVELAND 3" stroke; 120" throat
COVINGTON 10'2", stroke 6"
SOUTHWARD 400 ton, 7" stroke
THOMAS No. 20, 3" stroke, 35" throat
THOMAS No. 20, 3" stroke
WILLIAMS & WHITE Vert. 6" stroke, 36" throat

### PUNCHES—Double Head, Open Gap
CLEVELAND type C, 1¼" stroke, 26" throat
HILLES & JONES No. 3, 1⅜", 1¾", 2" strokes
LONG & ALLSTATTER Size "B"; cap. 2¼" dia., 1¼" thick

### PUNCHES—Horizontal
CLEVELAND style A.L., 1⅜" stroke
HILLES & JONES No. 2, 1½" stroke
HILLES & JONES No. 2, 1¼" stroke
HILLES & JONES No. 3, 1⅜" stroke

### FORGING MACHINES
AJAX horiz., 1½", 2", 4", 5"
AJAX Auto. rivet forging
AJAX Lever forging, size 43"

### PARTIAL LIST
Bulldozers, air compressors, hydraulic pumps, Axle Lathes, Planers, Saws, Welders, Turbines, Turbo Generators, Testing Machines, and a large quantity of SMALL TOOLS such as chain blocks, reamers, drills, cutters, etc.

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# LATE TYPE MACHINE TOOLS

**MAJORITY NEW SINCE 1940-1945 — FULLY GUARANTEED**

### BORING MILLS
#5-25—3" bar Defiance Table Type Horizontal
#31 Lucas—3" spindle Table Type Horizontal
#DB102 Excello Double End Six Spindle

### GEAR MACHINES
#12—12" Gleason Two Tool Straight Bevel Rougher
#36BM — 3 spindle Gould & Eberhardt Bevel Rougher — 1941
#48M Gould & Eberhardt Universal Hobber

### GRINDERS—CYLINDRICAL
10"x18" LANDIS TYPE C HYDRAULIC—1940
10"x16" NORTON TYPE C HYDRAULIC—1944—reciprocating attach.
6"x18" Norton Type C—Reciprocating & Shoulder Attachments—1941
18"x120" Norton Plain

### GRINDERS—INTERNAL
#73 Heald—1943
#72A5 Heald Plain—bridge—1942

### GRINDERS—SURFACE
#300 Hanchett Hydraulic Vertical Spindle
#16 Blanchard High Power Vertical Spindle

### GRINDER—THREAD
Model TG 615 Jones & Lamson Automatic (several) 1941

### GRINDER—MISC.
#87 Wickman High Precision Profile Grinder—1942

### HEADERS
#250F—Manville
#250F MANCILLE DSSD—1944
#2 Manville DSSD (2)
#11 Waterbury Farrell DSDD
#00 Waterbury Farrell DSDD
#2C Manville—SSSD Ball (2)
#3C Manville SSSD Ball
#188C Manville SSSD Ball

### LATHES
8"x84" Seneca Falls Lo-Swing (2)—1941
8"x132" Seneca Falls Lo-Swing
29"x33' Swift Geared Head—1941
#10 Sundstrand Automatic Stub
#1 Lodge & Shipley Duomatic

### MILLERS
#34-36 Cincinnati Plain Hydromatic (2) 1942
#5-48 Cincinnati Plain Hydromatic
#98 Cincinnati Horizontal (2) 1941
#96 Cincinnati—Vertical (several) 1941
#4 K & T Vertical
54"x18' Ingersoll Slab Miller

### PLANERS
120"x96"x20' Cincinnati Heavy Duty Box Table

### PRESSES
100 ton HPM Vertical Hydraulic—1946
#8K Cleveland Knuckle Joint—1942

### SCREW MACHINES
1⅞" Cone 8-spindle
⅞" 4-spindle Conomatic—1942—(2)
#6RPL 8 Acme Gridley 6-spindle Automatic—1940

### TURRET LATHES
#4 Gisholt Universal Geared Head
#4A Warner & Swasey Universal
#3A Warner & Swasey Universal
#1A Warner & Swasey Universal
#H-5 Libby Heavy Duty Geared Head 1941

### MISCELLANEOUS
#3 LeBlond Rifling Machine—1941
Webster Tallmadge Single Spindle Gun Barrel Boring—1942
#420 W. F. & J. Barnes Two-Spindle Deep Hole Drilling & Boring—1942
1½" Sutton Bar Straightening Machine
Inman Paper Box Machines

## J. L. LUCAS & SON, INC.

**Box 3006A, Bridgeport 5, Conn.—Tel: FAirfield 9-3393—Cables—Lucastools**



# ALL LATE TYPE

Lathe, Engine, Mackintosh-Hemphill, 72"/110"x30' centers, factory rebuilt, like new; Weight 90 Ton.

Turret—Midland #5, bar & chucker
Turret—Oster #601WD, 1½" collet
Shear—Sq., Famco Power 36"x18 G, New
Shear—Rotary—Quickwork #50A, Circle Cutter & Slitter 48"x¾"
Rolls—Forming. Farnham 6' (aircraft)
Spot Welder—75 KVA
Induction Heater—Lepel 7½ KW
Thread Mill—Morey 12"x10' centers, Int. & External.

## KINGS COUNTY MACHINERY EXCHANGE

**408 Atlantic Ave., Brooklyn, N. Y.**
**TRiangle 5-5237—Dept. "A"**



# POWER PRESSES

MEBA

JOSEPH **HYMAN** & SONS

Tioga, Livingston and Almond Streets, Philadelphia, Pa.



**Production Equipment for Sale or Trade**

4—Lo-Swing Automatic Lathes, Model 4"; U. R.
1—Lipe's Carbo-Lathe.
6—Spindle gang drill 2x12 ft. table.
2—Pratt-Whitney 2 spindles Profilers Model 12B.
1—Rail, frog and switch Planer 17½ ft. table.
3—Electric Ovens. 1—Royaline Degreaser.

**SPELCHAKE MACHINERY CO.**
947 PRITCHARD AVE., WINNIPEG, MAN.

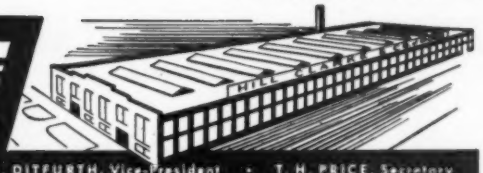


# SHEET METAL MACHINERY

NEW & USED — COMPLETE LINE OF
Box Brakes, Press Brakes, Notchers, Shears, Punches, Rolls, Spot Welders — Di-Acro, Pexto, Whitney Equipment, etc.

**B.D. BROOKS, INC.** 361 Atlantic Ave
Boston, Mass. Tel. HAncock 6-5200

# HILL-CLARKE
## MACHINERY COMPANY



ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary

### DRILLS
1 Spdl—28" Sw—No. 2 LMS L.G. Hyd.
2 Spdl—24" Sw—No. 2 Aveymatic
3 Spdl—15" Sw—No. 2—MA 6—Avey
4 Spdl—24" Sw—No. 3 Avey
6 Spdl—14" Sw—No. 2 LMS L.G. Hyd.

### GEAR MACHINES
No. 61-A Fellows Gear Shaper (1942)
No. 7 Fellows Gear Shaper (1942)
No. 72 Fellows Gear Shaper
11" Gleason Bevel Gear Generator
No. 13 Brown & Sharpe Spur & Bevel
No. 1 Whiton Auto. Gear Cutter
No. 6 Gleason Bevel Gear Tester (1942)
No. 2—36" Schuchardt & Schutte

### BORING MACHINES
Rockford—3½" Bar
34" King Vert. Bor. Mill

### GRINDERS
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x36" Norton Type C (1943)
10"x72" Landis Type C Hydraulic
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
14"x120" centers
16"-40" gap x 120" centers
18"x96" centers
18"-30" Gap x 96" centers
20"x96" centers
23"x36" centers
24"-32" Gap x 144" centers
15"x15"x8' Norton Surf. Gdr.
No. 25-A Heald Surface Grinder
No. 104 Rivett Internal Gdr. (1943)
72-A-3 Heald Internal Gdr.
No. 72-A-5 Heald Internal (1942)
No. 18-16 Bryant Internal Grd.
No. 18-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal

### LATHES
Model R-14 Seneca Falls Lo-Swing

### MILLING MACHINES
No. 3 Cincinnati H.P. Universal
No. 3B Milwaukee Plain
No. 0B Cincinnati Plain
No. 0B Cincinnati Vert.
No. 2½-B Milwaukee Vert
No. 3 Sundstrand Rigidmil
No. 45-48 Cin. Hyd. Tracer (1941)
4"x8" Hanson Whitney Thrd. Mill
6"x36" Lees-Bradner—Model LT (1943)
6"x80" Pratt & Whitney Thrd. Mill
6"x132" Pratt & Whitney Thrd. Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney Thread (1942)
10"x60" Pratt & Whitney Thrd. Mill
48"x24"x12' Ingersoll Slab Miller, 4 Hds.

### MISCELLANEOUS
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
18" Newton Slotter
10"x10" Rassmussen Saw, Stock Fd.
No. 0 Bakewell Tapper
Baush Radial Tapper
No. 307 Barnes Hone
Model H-7 Micromatic Vert,. Hone, 1 Spdl.
Model 200 Micromatic Horiz. Hone, 1 Spdl.
Model H-2 Micromatic Horiz. Hone, 2 Spdl.
Model 200—H5 Micro.—Horz.—2 Spdl.
Model HRS Barber Colman Hob Sharpener
14' Niles-Bement-Pond Roll
Am. Chip Wringers (New) 3.3 to 12.8 bushel capacity

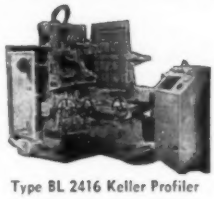
### PLANERS
36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray

C-3

*Write, Wire or Phone* **HILL-CLARKE MACHINERY COMPANY**
631 WASHINGTON BOULEVARD, CHICAGO 6, ILL. PHONE CEntral 6-0500



# RELIABILITY *has been earned by*
## WIGGLESWORTH MACHINE TOOLS



Type BL 2416 Keller Profiler

### AUTOMATICS
2" 4 Spindle Cone, 1943
8¾" Conomatic, 5 spindle
1½" Billings & Spencer Dimatic Cutoff

### BORING MILLS
Universal 3" bar
Lucas 3" bar, older
42" King, vertical, 2 rail heads
24" Bullard New Era, VTL

### GRINDERS
P & W Kellerflex flexible shaft
5 HP Marschke, single end
14x48" Thompson hydraulic surface, 1943
10x48" Norton cylindrical
24L36 Bryant Internal
72A Heald Internal, late
70A Heald Internal, late
10 x 18 Landis C, plain cylindrical
#5 Giddings & Lewis, hydraulic surface
10G Sellers, single end, horizontal
#16 Bryant Internal, hydraulic
Rogers #76A, knife-grinder
Oliver single point, tool
Model 1311 Pratt & Whitney, contour

### DRILLS
#3 Bausch 24 spdle., #2 M.T.
Allen 2 spindle, #2 M.T.
Walker Turner radial
6'17" American radial
D6 Colburn, single spindle, #5 M.T.
#21½ Footburt, single spindle, #4 M.T.
Baker single spindle, #5 M.T.
Model 4230 Bodine Drill & Tapper, 12 sta.
Moline Hole Hog, 2 spindle, older

### GEAR MACHINERY
672 B & S cutter
7A Fellows, shaper, high speed, hvy dty
61A Fellows, shaper, high speed precision

### LATHES
12"x30" centers, Hendey q.c.g.
Harding speed lathe, 9x18" centers
#12 LeBland Automatic Production
12 x 18" Lipe Carbo, semi-automatic
Model LoSwing 8 x 108" centers, g. h.
Gisholt Simplimatic, platen type
36" x 14' ctr. LeBlond, cone
36" x 14' centers, American, late

### MILLS
1-8 Kent Owens hand
Briggs production, hydraulic
2MH Cincinnati Universal
#5 B & S Plain Horizontal, cone
35-60 Cincinnati Hydromatic Duplex
24" Cincinnati Duplex
#4 Cincinnati High Power Horizontal
36 x 27" x 6' Newton, planer type

### FURNACES
Despatch Model DT 26, draw, gas
Whiting Converter, 2 ton cap., late
Lithdraw heat treat, 1200° F, late
Thermonic Induction, heat treat, late

### MISCELLANEOUS
ROTARY TABLE: 96" Ohio
PROFILER: Betts, 2 spindle
COMPARATOR: J & L, 30" shadowgraph
BROACH: #4 Lapointe, horizontal
KEYSEATER: #5 Mitts & Merrill
CUT-OFF: #33 B & O, 3" capacity
PLANER: Deitrick & Harvey, 48", Dble. housing
LAPPER: 86-36" Gardner, vert. spdle.
WELDERS: Hobart and P & H, Arc, 400 amp.
BULLDOZER: #2 Ajax High Speed, 30 ton
#29U Williams & White

### THREADERS
TG 615 J & L grinder, late
#2 Dalzen, 3" O.D., grinder
Model 40 Lees Bradner, miller
LT 6 x 36 Lees Bradner
#33 Excello External, grinder
#39 Excello Internal, grinder

No. 50 Excello Thread Grinder

## T. R. WIGGLESWORTH MACHINERY COMPANY
**1719 SUPERIOR AVENUE • • • SUPERIOR 1-8727 • • • CLEVELAND 14, OHIO**

### AUTOMATICS
⅞"-3 1/16" Cleveland 4 spdl.
2" Model B 18" Cleveland
No. 454 New Britain Chucking
14"x19" Fay

### BORING MILLS
84" Gisholt
100" Niles-Bement-Pond
2½" Cleveland horiz., long bed
3" Rockford
4" Detrick & Harvey floor type
No. 5D Moline 6 spdl. cylinder bore

### DRILLS
20" Barnes all geared self oiling
21" & 24" Cincinnati
Nos. 121, 217, 310 & 315 Baker
Barnes horizontal radial
3' Carlton sensitive radial
4' Cinc. Bickford univ. radial
6'-15" Dreses radial
16 spindle No. 13 Natco multiple
34 spindle No. 30 Natco multiple
4 spindle No. 4 Foote Burt rail
6 spindle No. 17 Foote Burt rail
1 & 4 spdl. Avey No. 2, woodpecker feed
No. 410 Barnes 2 spdl. rifle drill

### GEAR CUTTERS
Nos. 6 & 7125A Fellows shapers
Nos. 8H, 12H, 16HS, 18H & 24H G. & E.
No. 130 Cleveland Rigidhobber
No. 5A Lees Bradner hobber
4" Gleason spiral bevel
36" Gleason bevel planer
Gleason testers & lappers
Illinois involute tester
Red Ring shavers, lappers & speeders

### GRINDERS, CYLINDRICAL
6"x18", 10"x18" & 14"x36" Landis hydraulic
10"x24" & 16"x72" Landis mechanical
14"x36" Landis hydraulic universal
10"x36" Norton semi-automatic
10"x18", 10"x30" & 10"x50" Norton mech.

### GRINDERS, INTERNAL
No. 75A Heald hand feed
Nos. 72A3 & 72A5 Heald
No. 72A3 Heald, cross slid, head
No. 72A3 Heald Sizematic
Model MH1 Sav-Way
Grenby bench type

### GRINDERS, SURFACE
Nos. 10 & 16A2 Blanchard rotary
12" & 16", No. 22 Heald rotary
16", No. 25 Heald hydr. rotary
8" Pratt & Whitney rotary (tub)
14"x36" Pratt & Whitney vertical
8"x24", No. 78 Wilmarth & Morman
8"x22", No. 3 Abrasive

### MILLERS
No. 2A & 2AS Milwaukee
No. 2 Cincinnati, horiz. & vertical
No. 3 Ohio
12" Cincinnati Plain Mfg.
No. 1H-12" Kearney & Trecker
18" & 24" Cincinnati plain automatic
18", 24" & 48" Cincinnati duplex
No. 31 De Vlieg Supermil
No. 1-8 Kent Owens hydraulic
Nos. 1, 2 & 3 Kent Owens hand
No. 1 Kent Owens semi-automatic
20"x84" table Ingersoll vertical
Ingersoll Rise & Fall
6 spindle Moline profiler
24"x18"x14' Ingersoll planer
48"x24"x22' Ingersoll planer
30" Newton rotary
30", 42" & 84" Ingersoll rotary

### SHAPERS & PLANERS
20" G. & E. shapers
24" Columbia univ. shaper
16" Bement Miles slotter
36"x36"x8' Gray planer
48"x48"x12' Cleveland openside planer

**MILES MACHINERY CO.**
**Box 770 SAGINAW, MICH.**

# LATE MODEL TOOLS

### LATHES
12"x30" MONARCH Model CK Toolroom
16"x78" SIDNEY Geared Head Toolroom
14"x54" L & S Selective Geared Head Lathe
16"x30" MONARCH Model C Toolroom Lathe
16"x54" AMERICAN "Pacemaker" Multi-Production Lathe

### AUTO. LATHES & TURRETS
Model ESM-59 HARDINGE Hand Screw Machine
No. 2 B & O Geared Electric Turret Lathe
12"x21" J & L (Fay) Auto. Lathes
20"x25" J & L (Fay) Auto. Lathes
No. 5DE POTTER & JOHNSTON Auto. Turret Lathes
No. 4 GISHOLT Ram Type Univ. Turret Lathe

### MILLING MACHINES
No. 2S VAN NORMAN Ram Type Univ. Miller
No. 2KM KEARNEY & TRECKER Vert. Miller
36"x36"x16' INGERSOLL Adjustable Rail Planer Type Miller, 40 HP AC Motor Drive, One Rail Head, Two Side Heads.
No. 0S CINCINNATI Plain & Vert. Auto. Millers

### GRINDERS
No. 2 CINCINNATI UNIV. Tool & Cutter Grinder
6"x18" LANDIS Type C Plain Grinder
10"x18" LANDIS Type C Plain Grinder
10"x24" LANDIS Type C Universal Grinder
6"x18" NORTON Vert. Spdle Surface Grinder
14"x16"x60" MATTISON Hyd. Surface Grinder
16"x96" LANDIS Type B Plain Cyl. with Gap Bed
No. 5 BROWN & SHARPE Pl. Cyl. Grinder, 3"x18"
No. 16/28 BRYANT Hyd. Internal Grinder
No. 174 HEALD Hyd. Gap Internal Grinder

### DRILLS
No. 2LMS LELAND GIFFORD 2-spindle on 4 spindle base
No. 3MS LELAND GIFFORD 2-spindle, hydraulic feed
No. H-3 BARNES Single Spindle HYDRAM Drill
3'11" MORRIS "MOR-SPEED" Radial, 27 speeds, 7½ HP

### GEAR EQUIPMENT
No. 725A FELLOWS High Speed Gear Shaper
No. 145 CLEVELAND Rigid Hobber
No. 36BM GOULD & EBERHARDT Gear Rougher

### MISCELLANEOUS
16" GEMCO Shaper, M.D.
20" STEPTOE Shaper, Uiv. Tanble
No. ½B P & W Two Spindle Reaming Machine, 1944
4½"x36" PRATT & WHITNEY Model C Thread Miller
Model H-1 MICROMATIC Hydrohoner
6" TAYLOR & FENN Spline Millers
⅞" CONOMATIC 4-spindle Auto. Screw Machines

**Wigglesworth MACHINERY Co.**
203 BENT ST. CAMBRIDGE 41 MASS. KIRKLAND 7-5242
MACHINE TOOLS

**FLOOR TYPE MILL (HORIZ.)**
4" Bar G&L, 54" Vert., 62" Hor. Travel V-Belt M. Dr., 11' x 5'6" Floor Plate $7000.00.

**WEISBECKER MACHINERY COMPANY**
149 Broadway New York 6, N. Y.

## EVERY ITEM GUARANTEED
*All Late Type*

7" Barrett Horiz. Boring Mill, Floor Type
#28/120 Cincinnati Vert. Hydrotel Mill, 3 Spdl.
#28/60 Cincinnati Vert. Hydrotel Mills, 3 and 4 Spdl. (2)

25 Ton 48" Stroke Colonial Dual Ram Vertical Surface Broach
14' Niles Vert. Boring Mill
Bullard Multaumatic 12" 6 Spdl. Type D
5'-11" Carlton Radial Drill
60" Bickford Vertical Boring Mill
75 Ton Henry & Wright Dieing Press, '41
26x48, 26x72 & 20x48 O D Grinder
#7125A Fellows Gear Shaper, High Speed

150 Ton Cleveland #60-D-84 Punch Press Dbl. Crank, 16" stroke, 46½x 86" Bed.
200 Ton Verson, #40FS, Punch Press, 30" stroke, 35 x 37 bed.

Model LV Davis & Thompson Rotomatic Drill
8x15 & 12x22 Sundstrand Auto. Lathes
#2 Cincinnati Tool & Cutter Grinders
Planers 48x48x10' Cin. Dbl. Housing
#3R Gisholt Turret Lathe. 5" Capacity
#R-14 Lo-swing Production Lathe
#12 Van Norman Universal Mill
#2H Kearney & Trecker Vertical Mill
#3K Kearney & Trecker Horizontal Mill

#1½ Yoder Roll Former, 8 Spdl, 1½" Shaft dia. x 6½" Max. length flat strip, latest, w/cutoff
60" McKay Roller Levellers, ¼" to 2" Cap. and ½" to 2" Cap., armor plate (2)

**PAULS MACHINERY COMPANY**
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Phone TYLER 7-6300

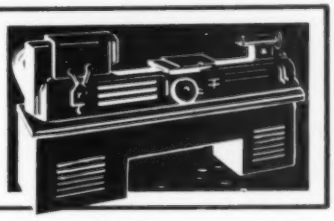
## LATE MODELS
#46 Heald Single End Borematic, Heavy Duty
#72 Fellows High Speed Gear Shaper
#1½ Buffalo Universal Ironworker
#4 Warner & Swasey Universal Turret Lathe
#7 Douglas Vertical Slotter
#2 Buffalo Forge Motor Spindle Drill
#08 Cincinnati Vertical Mill
#307 Barnes Vertical Hydraulic Hone
11" LeBlond Rapid Production Lathe

**ALEXANDER & FIDEN MACHINERY CO., INC.**
1014 Genesee St., Buffalo 11, N. Y.

## MACHINERY FOR SALE
**#35L Excello**
**THREAD GRINDER**
***Excellent Condition***
**Price.....$12,500.00**

**FAIRFIELD EQUIPMENT CO.**
100 Sanford St. at R.R. Station FAIRFIELD, CONN.

## BY SELECTIVE BUYERS OF USED MACHINE TOOLS



MOTCH & Merryweather used, reconditioned and rebuilt machine tools have the approval of hundreds of users of machinery.

These users have found from actual experience that they get full value for every dollar spent for Motch & Merryweather machines. They have also learned that the careful selection of machines purchased—skilled workmen in the shop—and the modern plant facilities of Motch & Merryweather are profitably reflected in the production from every machine bearing the Motch & Merryweather nameplate.

Although the conditions existing today have caused an acute shortage of good used machine tools the same dependable policy of selective buying and giving full value to the user is, and will continue to be, maintained by Motch & Merryweather.

***For a better buy . . . you better buy a Motch & Merryweather Machine***

THE MOTCH & MERRYWEATHER MACHINERY CO
CLEVELAND DETROIT CINCINNATI PITTSBURGH

**See MOTCH & MERRYWEATHER *first***

**USED MACHINERY DIVISION** 1350 EAST 222ND STREET EUCLID 17 • OHIO

## *OUT-OF-THE-ORDINARY OFFERINGS*

**? Do these items meet your requirements ?**

**MODEL 226-30 BESLEY OPPOSED DISC GRINDER**
Dia. of wheels 30". Max. opening between wheels 28". Friction Power Feed. Two (2) 20 H.P. motors and coolant.

**YODER M-31 CAM OPERATED BENDER**
Designed to bend inconsistent or irregular sweeps longitudinally in extruded or roll formed sections. Automatic and hand controls of bending shoe. Roll spindle dia. 3". 10 HP variable speed drive.

**KANE & ROACH MODEL ILS BENDER**
Designed to bend stock up to 12" wide within limits of machine. Pyramid Type arrangement. Roll shafts 3" dia. Will take rolls for flat, angles, special shapes, etc. 5 HP motor drive.

**No. 6 DEFIANCE 4½" BORING MILL**
Table 42"x75". Maximum distance from table to spindle 60". Max. distance from spindle to outboard support 120". 10 spindle speeds. 12 feeds. 10 HP motor drive.

**No. 6 CINCINNATI CENTERLESS GRINDER**
work cap. approx. 12" dia. Single or Multiple Grinding Wheel cap. up to 36" dia. x 36" wide. Filmatic Bearings.

**SUPER SPEED PRESSES**
Made by Ferracute Machine Co. 10 & 30 ton (2 available). Adjustable stroke. Infeed and outfeed rolls. Variable speed drive. Designed for extremely high production of blanked and shallow formed parts.

**HIGH PRODUCTION PRESS**
No. 645B Bliss. 85 ton cap. Double Crank. Tie Rod Construction. 1" stroke. Bed area 36"x18½". Shut height 10"; Infeed and outfeed rolls. Scrap cutter. 5 HP motor drive.

**THREAD GRINDER**
No. 101 Sheffield Precision Thread and Form Grinder. Capacity: 7" dia. x 12" length. Uses crusher roll to true grinding wheel.

**BATTERY OF HYDRAULIC MILLS**
Six (6) Handmills converted to hydraulic longitudinal table feed. Hydraulic cylinder on each Mill with Vickers controls. One pump furnishes pressure for all six mills. Each spindle driven by 1 HP motor.

***Many other Special and Standard Machines in our Stock. Let us know what you need. We can help you fill your requirements.***

**MACHINERY LIQUIDATING COMPANY**
**2671 MICHIGAN AVENUE** **Phone: TAshmoo 6-6650** **DETROIT 16, MICHIGAN**

# NOLL REBUILT
## late type MACHINE TOOLS

### AUTOMATICS
1⅝" New Britain 6-Spindle Model 206
3¼" Cleveland Model A Single Spindle
5½" Cleveland 4-Spindle Chucker

### BORING MILLS—Horiz. & Vert.
6" Bar Betts Horizontal Floor Type
36" Bullard Vertical
42" Cincinnati Vertical, Rapid Traverse
48-A Heald Borematic, Single End

### DRILLS & RADIALS
S.S. Cincinnati-Bickford 28", No. 4 M.T.
12-Sp. Baker Model 60-HO
6'17" Column Carlton Radial Drill
9' Arm Ridgway Radial No. 5 M.T.

### BROACHES
5-Ton Oilgear #2 Twin Ram Horiz. 36" Str.
20-Ton American 36" Stroke Type VP Hyd.

### FURNACES
Tempering, Lindberg 22" dia x 26" Deep-1250°
22KW Westinghouse Molten Lead Bath Cyl. Hardening 1600°

### GEAR EQUIPMENT
No. 6-60 Brown & Sharpe Gear Cutter
8" Gleason Bevel Gear Generator
12" Gleason Straight Bevel Gear Generators
15" Gleason Hypoid Generator
No. 16HS Gould & Eberhardt Spur Gear Hobber
18" Gleason Hypoid Gear Lappers

### GRINDERS
20x48" Van Norman Crankshaft Re-Grinder
5x40" Landis Cam Contour Grinding Machine
14x36" Norton Cylindrical Type "C"
18" Double End Besly No. 205 Disc Grinder
No. 12 Bryant Flange Type Work Spindle
No. 72-A3 Heald Sizematic
30"x160" B.C. Lobdell No. 3GH Roll Gr.
10"x18" Fitchburg 30° Ang. Spline Grs.
12" Heald No. 22 Rotary Surface Grinders
No. 31 Ex-Cell-O Precision Thread Grinder

### LATHES
171" BC Lodge & Shipley No. 3 Duomatic
12"x18" W.C. Lipe Carbo Lathe
Gisholt Turret, 6¼" hole in Spindle
21½x24" Jones & Lamson Flat Turret Lathe
20"x112" Lodge & Shipley Engine Lathe
5"x24" Seneca Falls Model "U" Low-Swing
No. 7 Foster Turret 3"x21" G.H.—Bar Feed
21"x7' LeBlond G.H. Engine Lathe with T.A.
36"x8' Betts-Bridgeford Engine Lathe

### MILLS
No. 000 Brown & Sharpe Plain Production
No. 3-24 Cincinnati Hydromatic
24" Cincinnati Duplex Production
16"x20" Automatic U-6 Univ. Hob Thr'd Mill

### PLANERS
Chandler 30"x30"x8'6" Table 12'x27"
Cincinnati 48"x36"x18' Planer 3 Heads

### PRESSES
7½-Ton Toledo No. ½ OBI
35-Ton Bliss #2031½ S.S., S.C. Punch Press
100-Ton HPM Hyd. Bed 18x18", 12¼" Stroke
243-Ton Toledo #95-D, D.C., D.B.G. Press
545-Ton Toledo #59-3⅛ S.S., S.C., 5" Stroke

### SHAPERS
24" Gould and Eberhardt
30" Morton Horizontal Draw Cut
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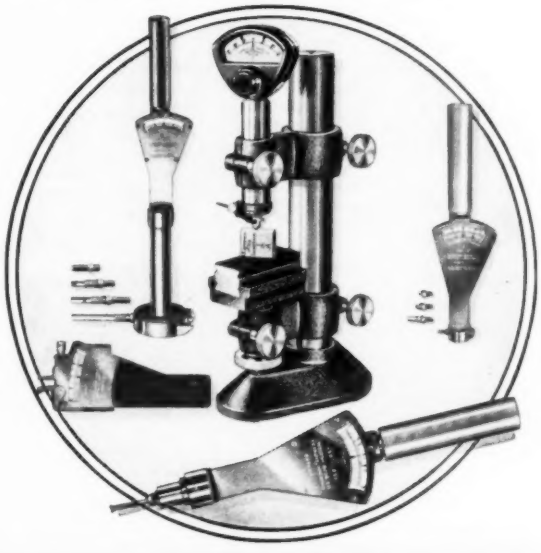

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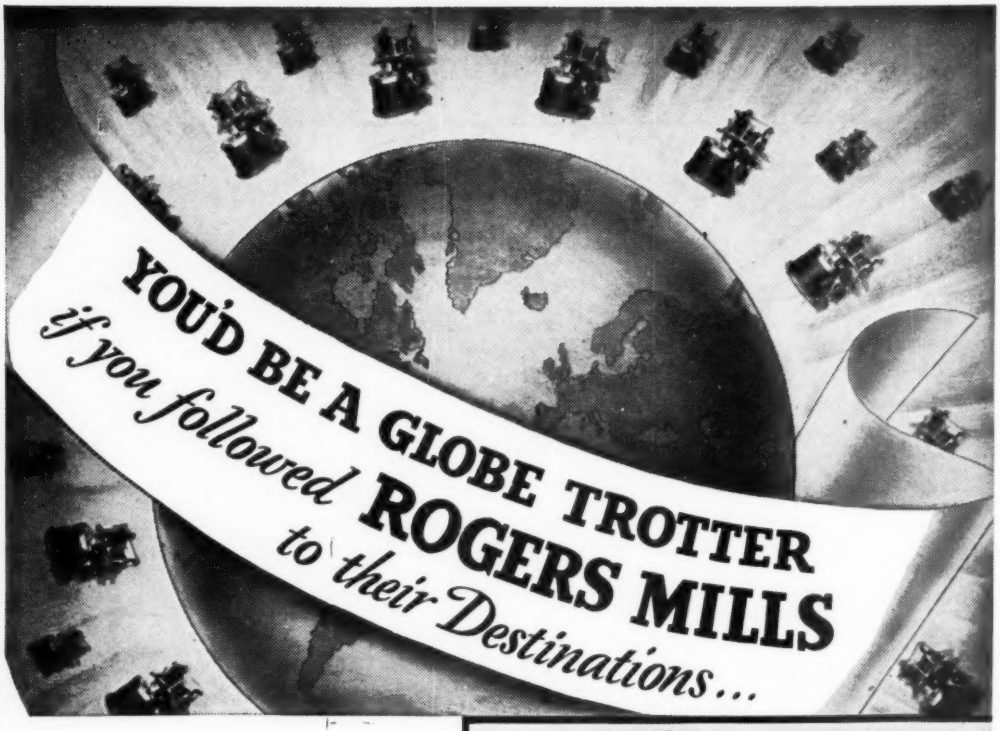


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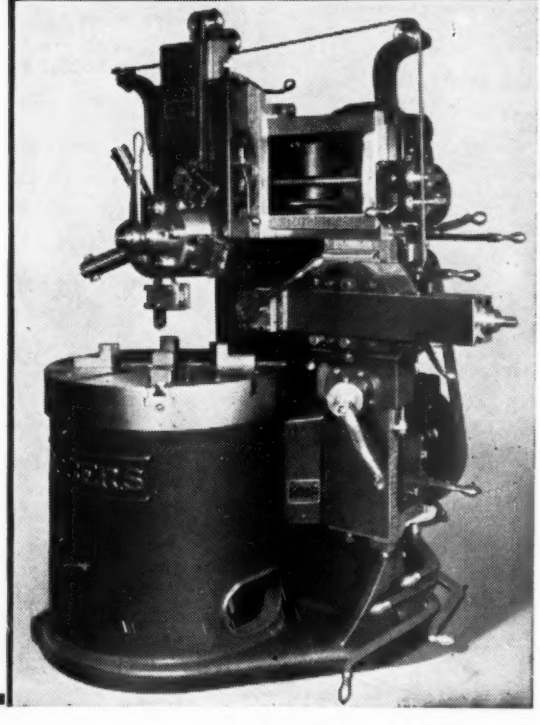

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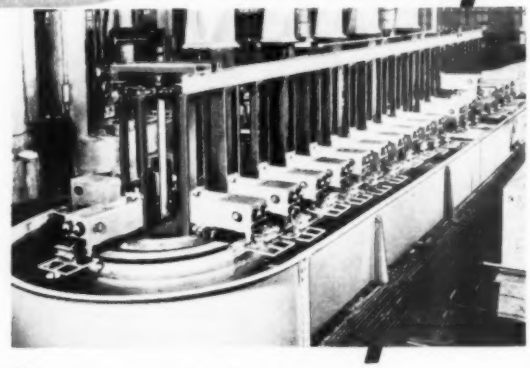

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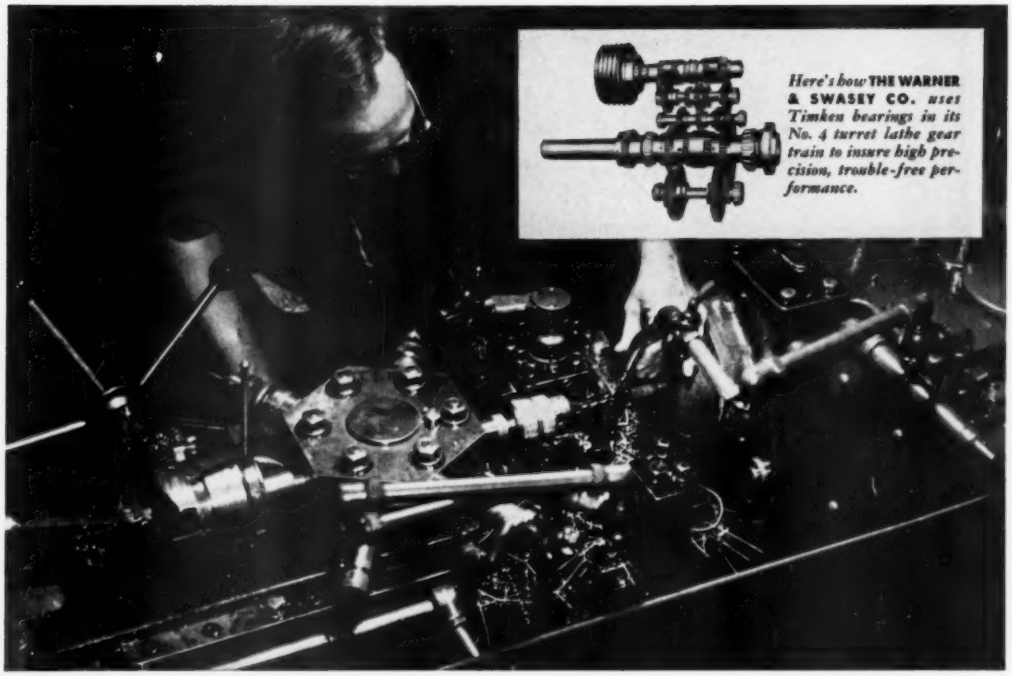



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